TECHNICAL MANUAL

AVIATION-CREW SYSTEMS

OXYGEN EQUIPMENT

(CONVERTERS)

N68936-04-D-0008

This manual update includes Basic, dated 1 April 2001, thru Change 4, dated 1 August 2004.

This manual supersedes the following NAVAIR manuals, 13-20FP-1, 13-20FP-2, 13-20FP-5, and 13-20FP-6.

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1 APRIL 2001

CHANGE 4 - 1 AUGUST 2004

LIST OF EFFECTIVE PAGES

Insert latest changed pages; dispose of superseded pages in accordance with applicable regulations.

NOTE: On a changed page, the portion of the text affected by the latest change is indicated by a vertical line, or other change symbol, in the outer margin of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Dates of issue for original and changed pages are:

Original . . . . 1 Apr 2001
Change 1 . . . . 1 Sep 2002
Change 2 . . . . 1 Jun 2003 (Incorp IRAC 1)
Change 3 . . . . 1 Jan 2004
Change 4 . . . . 1 Aug 2004

Total number of pages in this manual is 362, consisting of the following:

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Major changes resulting from this change are as follows:

1. Incorporation of Aircraft Accident Report Inspection information.
2. Miscellaneous changes.

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CHAPTER 1

INTRODUCTION

1-1. GENERAL.

WARNING

Unauthorized modifications to and deviations from prescribed life support and survival equipment by individual aircrewmembers could create unknown safety hazards. The OPNAVINST 3710.7 Series specifies minimum requirements for such equipment and is supplemented by the individual model NATOPS.

1-2. The OPNAVINST 4790.2 Series identifies NAVAIRSYSCOM as the only authority for modification to life support equipment and survival equipment, which is usually accomplished by the Fleet Support Team (FST) (formerly Cognizant Field Activity (CFA)) via Aircrew System Changes or a change to the equipment procurement package. This manual also permits operating activity with approval of the controlling custodian, to conditionally modify ONE unit of equipment in service to correct or overcome unsatisfactory conditions in that equipment item. Any other type of deviation, peculiar configuration, or modification to life support and survival equipment is not allowed, and Aircrew Survival Equipmentmen have no authority or responsibility to perform them.

1-3. If an omission or conflict should occur between FST documents and NATOPS requirements, if there is a need for clarification of equipment configuration, or if equipment deficiencies are discovered, the applicable FST should be notified. The FST for most of the life support and survival equipment is the Naval Air Warfare Center Aircraft Division (NAWCAD) Code 4.6.3.2, NAS Patuxent River, MD, 20670-1906. For parachutes and related hardware, including torso harnesses, the FST is the Naval Air Warfare Center Weapons Division, Code 463000D, China Lake, CA, 93555.

1-4. Naval Air Warfare Center, Indianapolis, Indiana has cognizance over all survival radios and emergency beacons.

1-5. This Aviation Crew Systems manual is released under the authority of the Naval Air Systems Command in compliance with the request of the Chief of Naval Operations. The instructions continued herein are mandatory. This manual consists of separately bound volumes as listed below:

TITLE	PUBLICATION NUMBER
Inflatable Survival Equipment (Liferafts)	NAVAIR 13-1-6.1-1
Inflatable Survival Equipment (Life Preservers)	NAVAIR 13-1-6.1-2
Parachutes	NAVAIR 13-1-6.2
Seat Survival Kits (Oxygen Hoses and Non-SKU Seat Kits)	NAVAIR 13-1-6.3-1
Seat Survival Kits (SKU Series Seat Kits)	NAVAIR 13-1-6.3-2
Oxygen Equipment (Aircraft Equipment, Masks, and Other Systems)	NAVAIR 13-1-6.4-1
Oxygen Equipment (Regulators)	NAVAIR 13-1-6.4-2
Oxygen Equipment (Concentrators)	NAVAIR 13-1-6.4-3
Oxygen Equipment (Converters)	NAVAIR 13-1-6.4-4
Rescue and Survival Equipment	NAVAIR 13-1-6.5
Aircrew Personal Protective Equipment (Aircrew/Passenger Equipment)	NAVAIR 13-1-6.7-1
Aircrew Personal Protective Equipment (Clothing)	NAVAIR 13-1-6.7-2
Aircrew Personal Protective Equipment (Helmets and Masks)	NAVAIR 13-1-6.7-3
Aircrew Personal Protective Equipment (Protective Assembly, Aircrew Survival - Armor)	NAVAIR 13-1-6.7-4
Special Missions Aircrew Equipment	NAVAIR 13-1-6.10

1-6. The purpose of each volume is to provide technical information related to the configuration, application, function, operation, storage, and maintenance of a particular category of aircrew safety and survival equipment. The information contained in each volume is intended for Organizational, Intermediate, and Depot Levels of maintenance as established within the Naval Aviation Maintenance Program, OPNAVINST 4790.2 Series.

1-7. DESCRIPTION OF NAVAIR 13-1-6.4-4.

1-8. CONTENTS. This volume contains information and instructions pertaining to the configuration, function, application, operation, storage, and maintenance of oxygen equipment.

1-9. CONFLICTS AND SUPERSEDURE. This volume shall take precedence over all other documents except for effective Aircrew System Bulletins and Changes and Interim Aircrew System Bulletins and Changes. These documents are effective until officially rescinded, canceled, or superseded.

1-10. The Modification Section of each chapter lists all effective changes which affect oxygen equipment and have been issued on or before the date of latest change or revision to this volume. When applicable, the subject matter of these documents has been incorporated within the text of the appropriate chapters of this volume.

1-11. Effective changes and bulletins which affect oxygen equipment and are issued between changes or revisions to this volume should be recorded in the modification section of the manual for the affected equipment by annotating the outer margin of the page with a vertical line and the number of the change or bulletin. A copy of the change or bulletin should be filed in a separate binder in the ALSS work center. When this volume is updated these documents will be listed in the modification sections of the applicable chapters and the text of the chapters will be updated as required.

1-12. UPDATING. This volume will be updated periodically by the issuance of a Revision which is a 100% replacement of pages. Between revisions, changes and rapid action changes will be released, which are partial replacement of pages. All added and changed pages shall be incorporated in the volume according to page number. Superseded and deleted pages shall be discarded in accordance with local security procedures for data containing distribution statements. A list of effective pages is provided with each change. A summary of the major changed areas for a particular change is located directly beneath the list of effective pages.

1-13. COMMENTS AND RECOMMENDATIONS. Comments and recommendations shall be submitted in accordance with OPNAVINST 4790.2 Series.

1-14. ENGINEERING DRAWINGS. Government engineering drawings are available to the fleet by submitting a letter of request to Commanding Officer, Naval Air Technical Data and Engineering Service Command, Naval Air Station North Island, P.O. Box 357031, Building 90 Distribution, San Diego, CA 92135-7031. Each request should include the equipment nomenclature, part number, and CAGE code. The Drawings will be provided in the form of aperture cards (Automatic Data Processing Punch Cards). Technical data may also be obtained online at the NATEC website located at http://www.natec.navy.mil. Authorized users must first establish an account prior to obtaining data. Access/account information can be obtained at the NATEC website.

1-15. TECHNICAL DIRECTIVES AND FORMS. NATEC is the central management activity for aeronautical technical publications, engineering drawings and associated technical services. Upon release, NATEC will forward to all designated activities, copies of Technical Directives and Forms. Additional copies are available utilizing the procedures shown in paragraph 1-14 as well as from the PMA-202 website at https://pma202.navair.navy.mil.

1-16. SUPPLEMENTARY PUBLICATIONS.

1-17. In addition to Aircrew Systems Bulletins and Changes and Interim Aircrew Systems Bulletins and Changes still in effect, the following publications supplement this volume.

1. Naval Aviation Maintenance Program, OPNAVINST 4790.2 Series.

2. NAVAIR 00-35QH-2, Allowance List, Aviation Life Support System and Airborne Operation Equipment for Aircraft Squadrons Navy and Marine Corps.

3. Naval Logistical Library (NAVSUP 600), which lists directives and manuals available from the supply system.

4. The applicable Aircraft Maintenance Instruction Manuals, Planned Maintenance System Publications, NATOPS Flight Manuals, and Pilot's Handbooks.

5. OPNAVINST 4410.2A.

6. OPNAVINST 3710.7 Series provides general instructions on required minimums for aircrew personal protective equipment.

7. NAVFAC/DM-24. Naval Facilities Engineering Command design manual.

8. P2300. List of Repairable Assemblies and Applicability of Navy Aviation Materials.

9. P2310. List of Supporting Repair Parts of Navy Aviation Materials.

10. NAVSUPINST 4423.29 Series. Naval Material Command (NMC) Uniform Source, Maintenance and Recoverability (SM&R) Codes.

11. NAVAIR 13-1-6-8 Aviation Crew Systems Work Unit Code Manual.

12. NAVAIR 01-1A-509 Cleaning and Corrosion Control Organizational and Intermediate Maintenance.

13. NAVAIR 06-30-501 Technical Manual of Oxygen/Nitrogen Cryogenic Systems.

14. NAVSUPINST 4440.128 Compressed Gases and Gas Cylinders, Storage, Handling and Testing.

15. Ground Support Equipment. All Ground Support Equipment comments and recommendations shall be directed to the cognizant activities, Naval Air Engineering Center, Ground Support Equipment Dept., Lakehurst, NJ 08733.

16. NAVSUP P-719 is a Guide for the Assignment and Use of Source, Maintenance and Recoverability (SM&R) Codes.

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CHAPTER 2

MAINTENANCE CONCEPTS, SCHEDULING, AND DOCUMENTATION

Section 2-1. Maintenance Concepts

2-1. GENERAL.

2-2. NAVAL AVIATION MAINTENANCE PROGRAM. All maintenance and inspection actions upon Aviation Life Support Systems (ALSS) equipment shall be made as part of the Naval Aviation Maintenance Program in accordance with OPNAVINST 4790.2 Series.

2-3. LEVELS OF MAINTENANCE. Maintenance of ALSS equipment shall be performed at the established level of maintenance in accordance with OPNAVINST 4790.2 Series.

2-4. QUALIFIED PERSONNEL. Refer to OPNAVINST 4790.2 Series for qualifications of personnel authorized to perform maintenance actions on ALSS equipment.

Section 2-2. Maintenance Scheduling

2-5. GENERAL.

2-6. INSPECTION CYCLES. Scheduled maintenance requirements for aircraft and man-mounted equipment are published in the applicable aircraft maintenance requirement cards and this manual.

NOTE

To meet unusual situations and facilitate workload scheduling, refer to OPNAVINST 4790.2 Series for authorized deviations to scheduled phase inspection intervals.

Section 2-2A. Accident Evaluation

2-6A. AIRCRAFT ACCIDENT REPORT INSPECTION.

2-6B. Any Aviation Life Support System Equipment along with related subassemblies or equipment which have been recovered following use in an emergency ditching/bailout or ejection (refer to NAVAIR 13-1-6.2 for personnel and drogue parachutes) will be returned to the nearest Naval Supply Activity for shipment via traceable means to: Code 4.6.3.3, Naval Air Warfare Center Aircraft Division, Bldg 2187, 48110 Shaw Rd., Unit 5, Patuxent River, MD 20670-1906.

NOTE

Under no circumstances will any piece of Aviation Life Support System equipment which has been subjected to ditching/bailout or ejection be returned to service.

2-6C. Stencil outside of container in 1-in. letters as follows: THIS EQUIPMENT HAS BEEN USED IN AN EMERGENCY. These items of equipment are required for evaluation and determination of design deficiency and to establish requirements for product improvement.

Section 2-3. Maintenance Documents

2-7. GENERAL.

2-8. DOCUMENTING MAINTENANCE ACTIONS. Upon completion of any maintenance action (e.g., inspections, repairs, modifications), appropriate entries shall be made on applicable maintenance records, in accordance with OPNAVINST 4790.2 Series. The entries by the Aircrew Survival Equipmentperson shall provide a systematic record of equipment history and the documentation of all maintenance actions performed on the equipment.

2-9. MAINTENANCE DOCUMENTS. Refer to OPNAVINST 4790.2 Series for documents used to record history or to document maintenance actions or for additional information for completion of maintenance records. These records are designed to provide continuous configuration and inspection records throughout the service life of ALSS assemblies and their components.

Section 2-4. Illustrated Parts Breakdown Information

2-10. GENERAL.

2-11. This section explains the Illustrated Parts Breakdown (IPB) for ALSS equipment. The IPB can be found at the end of each chapter where applicable. The IPB should be used during maintenance when requisitioning and identifying parts.

2-12. SYMBOLS AND ABBREVIATIONS. Symbols and abbreviations used in the Illustrated Parts Breakdown are as follows:

Symbol	Definition
---*---	Closure (end) of attaching parts
#	Selected part, only one used
x	By (used in dimensions 12 in. x 6 in.)
&	And

Abbreviation	Definition
AR or A/R	As Required
CAGE	Commercial and Government Entity
COML	Commercially available
FIG, Fig	Figure
GAPL	Group Assembly Parts List
GFE	Government Furnished Equipment
IPB	Illustrated Parts Breakdown
L.H.	Left Hand
MAINT	Maintenance
NHA	Next Higher Assembly
No.	Number
RECOVER, RECY	Recoverability
REF	Reference
R.H.	Right Hand
SM&R	Source, Maintenance and Recoverability
Spec. Cont. Dwg. or SCD	Specification Control Drawing

2-13. GROUP ASSEMBLY PARTS LIST.

2-14. The Group Assembly Parts List (GAPL) contains illustrations and parts lists for each major assembly. These illustrations and accompanying lists show how the major assemblies are disassembled into subassemblies and detail parts. Each item illustrated is indexed for identification purposes. Each illustration is accompanied by a parts list providing a part number, description, and quantity for each item. The list is arranged in disassembly order. Through the use of a system of indentation, the relationship of the detail parts to the subassemblies and the relationship of the subassemblies to the main assembly, is shown.

2-15. FIGURE AND INDEX NUMBER COLUMN. The figure and index number of each item shown on the corresponding illustration appears in the Figure and Index Number Column, with the exception of assemblies and subassemblies which are not illustrated in assembled form. In these cases, the assemblies or subassemblies are listed but not indexed. The component parts thereof are both listed and indexed.

2-16. PART NUMBER COLUMN. This column contains the contractor's drawing number, government standard number, vendor drawing number or identifies the part as being commercial hardware (COML). Government standard parts are listed using the applicable MS, AN, AF, NAF, MIL, or JAN part number. Where the part number is controlled by a military specification, this specification number is listed in the Description Column.

2-17. DESCRIPTION COLUMN. This column lists the item name plus those modifiers necessary to identify the item. The description of a vendor-supplied item includes a five-digit number which identifies the manufacturer. This is the Commercial and Government Entity (CAGE) code. To correlate this CAGE code to the manufacturer's name, refer to the cataloging handbook H4/H8. CAGE codes may be omitted for prime manufacturer's parts and for government standard parts. When applicable, contractor's control drawing numbers and reference designations of electronic parts are also listed for general reference. When a separate exploded view is used to show the detail parts of an assembly or subassembly the Description Column contains an appropriate figure cross-reference in parentheses following the description. This cross-reference appears both in the listing where the assembly is first described, and in the listing which the assembly is broken down. In the latter case, the abbreviation REF will appear in the Units Per Assembly column. Commercial hardware items (COML) are fully described so that they may be procured from normal commercial sources. Parts stocked in kits are identified with kit component code in this column, i.e., KD.

2-18. Indentation. The indentations headed “1” through “7” in the Description Column are provided to show the relationship of assemblies and their detail parts. The detail parts are indented one space to the right and listed below the assembly to which they belong. Determine the next higher assembly (NHA) of any detail part by locating, in the next space to the left (excluding attaching parts) the first item above the detailed part.

1 2 3 4 5 6 7

ARTICLE (or MAIN ASSEMBLY)

. Detailed parts for ARTICLE (or MAIN ASSEMBLY)

. ASSEMBLY

(ATTACHING PARTS)

. ATTACHING PARTS FOR ASSEMBLY

---*---

. . Detailed parts for ASSEMBLY

. . SUBASSEMBLY

(ATTACHING PARTS)

. . ATTACHING PARTS FOR SUBASSEMBLY

---*---

. . . Detailed parts for SUBASSEMBLY

. . . SUB-SUBASSEMBLY

(ATTACHING PARTS)

. . . ATTACHING PARTS FOR SUB-SUBASSEMBLY

---*---

. . . . Detailed parts for SUB-SUBASSEMBLY

2-19. Attaching Parts. Attaching parts are items used to attach parts or assemblies to each other and follow immediately after the part to be attached. The attaching parts have the same indentation as the part attached. The caption “(ATTACHING PARTS)” is placed on the line immediately above the listing of attaching parts. The separation symbol ---*--- appears on the line immediately under the last attaching part. Quantities of attaching parts are listed per unit. For example, if two fittings are required for each assembly and one bolt is required to attach each fitting, the correct listing would be:

. FITTING ASSEMBLY, Hinge 2

(ATTACHING PARTS)

. BOLT 1

---*---

2-20. UNITS PER ASSEMBLY COLUMN. This column shows the quantity of an item required in the next higher assembly. The abbreviation AR indicates when the quantity is “As Required”.

2-21. USABLE ON CODE COLUMN. Usable on codes are used to indicate part usage where various models and serial numbers of the equipment or similar parts within the equipment use different parts. A code is assigned to each variation of the equipment and entered into the GAPL when a part is used only in a specified variation. Where no code is entered, the part is used on all units covered by the GAPL or when no variations from the original equipment exist.

2-22. NUMERICAL INDEX.

2-23. The numerical index which follows each GAPL contains all the part numbers listed in that GAPL, arranged in alphabetical-numerical sequence.

2-24. PART NUMBER COLUMN. This column contains the part numbers of the parts and assemblies. Part number arrangement starts at the extreme left-hand position and continues left to right, one position at a time, according to the following order or precedence:

Space	(blank column)
Diagonal	(Slant)
Point	(period)
Dash	(hyphen)
Letters	A through Z
Numerals	0 through 9

NOTE

Spaces, diagonals, points, and dashes do not appear in the extreme left-hand position of the part numbers. However, they may be used in the second and succeeding positions and take precedence over letters and numbers as indicated above.

2-25. FIGURE AND INDEX NUMBER COLUMN. In this column, the digits preceding the dash refer to the figure in which the parts are illustrated. The digits following the dash are the index numbers.

2-26. SOURCE, MAINTENANCE AND RECOVERABILITY (SM&R) CODE COLUMN. The five digit SM&R codes, assigned by Naval Air Systems Command Representatives are reflected in the SM&R code column. The code format is composed of three parts consisting of a two-position Source Code, a two-position Maintenance Code and a one-position Recoverability Code. See table 2-1 for basic information.

NOTE

For more complete information on Uniform SM&R Codes, refer to NAVSUPINST 4423.29, OPNAVINST 4410.2A, and NAVSUP P-719.

Table 2-1. Source, Maintenance, and Recoverability (SM&R) Code Definitions

SOURCE			MAINTENANCE			
1st POS	2nd POSITION		3rd POSITION		4th POSITION	
MEANS OF ACQUIRING SUPPORT			USE: LOWEST LEVEL AUTHORIZED TO REMOVE/ REPLACE THE ITEM.		REPAIR: LOWEST LEVEL WITH CAPABILITY AND RESOURCES TO PERFORM COMPLETE REPAIR ACTION.	
P	A	ITEM: STOCKED	O	ORG/UNIT	O	ORG/UNIT
	B	ITEM: STOCKED, INSURANCE				
	C	ITEM: STOCKED, DETERIORATIVE				
	D	ITEM: SUPPORT, INITIAL ISSUE OF OUTFITTING & STOCK ONLY FOR ADDITIONAL INITIAL ISSUE	2 3 4 5 6	MINESWEEPER SUBMARINES AUX/AMPHIB DESTROYER, FFG CRUISER/CARRIER	2 3 4 5 6	MINESWEEPER SUBMARINES AUX/AMPHIB DESTROYER, FFG CRUISER/CARRIER
	E	EQUIPMENT: SUPPORT, STOCKED FOR INITIAL ISSUE OR OUTFITTING OF SPECIFIED MAINTENANCE ACTIVITIES				
	F	EQUIPMENT: SUPPORT, NONSTOCKED, CENTRALLY PROCURED ON DEMAND	F	I/AFLOAT	F	I/AFLOAT
	G	ITEM: STOCKED FOR SUSTAINED SUPPORT. UNECONOMICAL TO PRODUCE AT A LATER TIME				
	H	ITEM: STOCKED, CONTAINS HAZMAT. HMIS/MSDS REPORTING REQUIRED	G	ASHORE AND AFLOAT	G	ASHORE AND AFLOAT
	R	TERMINAL OR OBSOLETE, REPLACED				
	Z	TERMINAL OR OBSOLETE, NOT REPLACED				
K	D	ITEM: DEPOT O/H & MAINTENANCE KITS	H	I/ASHORE	H	I/ASHORE
	F	ITEM: MAINTENANCE KIT, PLACE AT O, F, H, L				
	B	ITEM: IN BOTH DEPOT REPAIR AND MAINT. KITS				
M	O	MFR OR FAB AT UNIT LEVEL				
	F	MFR OR FAB AT INTERMEDIATE/DS LEVEL	K	CONTRACTOR FACILITY	K	CONTRACTOR FACILITY
	H	MFR OR FAB AT INTERMEDIATE/GS LEVEL				
	L	MFR OR FAB AT SPECIALIZED REPAIR ACTIVITY (SRA)				
	G	MFR OR FAB AT ASSEMBLED AFLOAT OR ASHORE				
	D	MFR OR FAB AT DEPOT MAINTENANCE LEVEL	L	INTERMEDIATE SRA	L	INTERMEDIATE SRA
A	O	ITEM: ASSEMBLED AT ORG/UNIT				
	F	ITEM: ASSEMBLED AT INTERMEDIATE LEVEL - AFLOAT				
	H	ITEM: ASSEMBLED AT INTERMEDIATE LEVEL - ASHORE	D	DEPOT	D	DEPOT
	L	ITEM: ASSEMBLED AT SRA				
	G	ITEM: ASSEMBLED AFLOAT OR ASHORE				
	D	ITEM: ASSEMBLED AT DEPOT MAINTENANCE LEVEL				
X	A	ITEM: REQUISITION NEXT HIGHER ASSEMBLY			Z	NON-REPAIRABLE
	B	ITEM: NOT PROCURED OR STOCKED, AVAILABLE THRU SALVAGE, REQ. BY CAGE/PART NUMBER	Z	REF ONLY		
	C	INSTALLATION DRAWING, DIAGRAM, INSTRUCTION SHEET, IDENTIFY BY CAGE/PART NUMBER			B	RECONDITION
	D	NON-STOCKED, OBTAIN VIA LOCAL PURCHASE				

RECOVERABILITY		SERVICE OPTION CODE	
5th POSITION		6th POSITION	
DISPOSITION: WHEN UNSERVICEABLE OR UNECONOMICALLY REPAIRABLE, CONDEMN OR DISPOSE.		ASSIGNED TO SUPPORT ITEMS TO CONVEY SPECIFIC INFORMATION TO THE SERVICE'S LOGISTICS COMMUNITY/OPERATING FORCES.	
O	ORG/UNIT	1	I-LEVEL 1ST DEGREE
F	I/AFLOAT	2	I-LEVEL 2ND DEGREE
G	ASHORE AND AFLOAT	3	I-LEVEL 3RD DEGREE
H	I/ASHORE	6	COMMERCIAL ITEM, ORGANICALLY MFR'D
K	DLR; CONTRACTOR FACILITY	8	NON-CONSUMABLE; 2ND DEGREE ENGINE I-LEVEL
		9	NON-CONSUMABLE; 3RD DEGREE ENGINE I-LEVEL
L	INTERMEDIATE SRA LEVEL	E	END TO END TEST
		J	INTER-SERVICE DLR REPAIRABLE BELOW D-LEVEL
D	DLR; CONDEMN OR DISPOSE AT DEPOT	P	PROGRESSIVE MAINTENANCE
Z	NON-REPAIRABLE	R	GOLD DISC REPAIR
A	NON-REPAIRABLE BUT REQUIRES SPECIAL HANDLING	T	TRAINING DEVICES

CHAPTER 3

OXYGEN EQUIPMENT – GENERAL INFORMATION, SAFETY, AND HANDLING

Section 3-1. Aircraft Oxygen Systems

3-1. GENERAL.

3-2. Aircraft Liquid Oxygen and Gaseous Oxygen Systems provide the aircrewmember with diluted or 100% oxygen for breathing. The Liquid Oxygen System provides facilities to store and convert liquid oxygen (LOX) to gaseous oxygen and to deliver the gaseous oxygen at a breathable temperature and pressure to the aircrewmember. The Gaseous Oxygen System provides facilities to store gaseous oxygen in cylinders at either high or low pressure and to deliver it to the aircrewmember at a reduced pressure for breathing. This chapter also contains safety precautions pertinent to handling and storage of liquid and gaseous oxygen equipment.

3-3. AIRCRAFT OXYGEN SYSTEMS.

3-4. Aircraft Oxygen Systems installed in naval aircraft fall into one of the following categories:

1. Gaseous Oxygen Systems

    a. Low Pressure (0-500 psig)

    b. High Pressure (0-1800 psig)

    c. Reduced High Pressure

2. Liquid Oxygen Systems

3-5. GASEOUS OXYGEN SYSTEMS. Gaseous Oxygen Systems are used primarily in multiplace aircraft where space and weight considerations are less important items. Basically, all Gaseous Oxygen Systems consist of the following:

1. A cylinder (or cylinders) for storing the oxygen supply.

2. Tubing to distribute the oxygen from the main supply to the user(s).

3. Various valves for directing the oxygen through the proper tubing.

4. A regulator (or regulators) to control the flow of oxygen to each user.

5. A gage (or gages) to indicate oxygen pressure.

6. A mask (or masks) to direct the flow of oxygen to each user.

NOTE

The aircraft Illustrated Parts Breakdown (IPB) shall be consulted for specific items used and make-up of the system for specific aircraft.

3-6. LIQUID OXYGEN SYSTEMS. Liquid Oxygen Systems are generally used in aircraft where space, weight, and mission considerations are paramount. The typical system consists of the following components:

1. A converter (or converters) for storing the liquid oxygen supply.

2. A filler valve for servicing the system.

3. A heat exchanger for warming the oxygen to normal breathing temperatures.

4. A control valve for maintaining desired system operating pressure.

5. A relief valve to relieve excess pressure.

6. Tubing to distribute oxygen to the user(s).

7. Regulator(s), quantity indicator(s), shutoff valve(s), and other essential cockpit (or cabin) equipment.

NOTE

The aircraft Illustrated Parts Breakdown (IPB) shall be consulted for specific items used and make-up of the system for specific aircraft.

3-7. OXYGEN BREATHING REGULATORS.

3-8. DILUTER DEMAND TYPE REGULATORS. Diluter Demand Regulators are currently installed in some naval aircraft. They are used with Gaseous Oxygen Systems. The Diluter Demand Regulator provides the aircrewmember with an air-oxygen mixture, or 100% oxygen, depending on mode of operation selected. By placing the diluter lever (or knob) in the NORMAL position, an air-oxygen mixture is supplied upon demand up to approximately 28,000 to 32,000 feet. The ratio of oxygen-to-air is automatically adjusted to supply increasing oxygen as altitude increases. At approximately 32,000 feet, ambient air is shut off, and the user receives 100% oxygen. By selecting 100% OXYGEN, the regulator supplies 100% oxygen at all altitudes.

3-9. AUTOMATIC POSITIVE PRESSURE DILUTER DEMAND TYPE REGULATORS. Several types of Automatic Positive Pressure Diluter Demand Regulators are currently installed in naval aircraft. These regulators are used with either Gaseous or Liquid Oxygen Systems. Operation of the Automatic Positive Pressure Diluter Demand Regulator at altitudes up to 28,000 to 32,000 feet is basically the same as the Diluter Demand Regulator. Above approximately 30,000 feet, added oxygen at a positive pressure is supplied to the mask. This added pressure increases with altitude. Service ceiling of these regulators is 50,000 feet, but due to human limitations, Automatic Positive Pressure Diluter Demand Regulators shall not be used above 43,000 feet, except for very short periods.

3-10. MINIATURE OXYGEN BREATHING REGULATORS. Miniature Oxygen Regulators reduce and regulate supply pressure, and deliver 100% oxygen to the user at a breathable pressure. A safety pressure feature automatically maintains a positive pressure of 0 to 2.5 in H_2O in the mask at all altitudes up to, and including, 34,000 feet. The pressure breathing feature maintains a positive pressure in the mask of up to 20.0 in H_2O at altitudes between 35,000 and 50,000 feet. The positive pressure increases as altitude increases. Miniature Oxygen Regulators can be used routinely up to approximately 43,000 feet, but due to human limitations, Miniature Oxygen Regulators shall not be used above 43,000 feet except for very short periods.

3-11. DILUTER DEMAND TORSO-MOUNTED OXYGEN REGULATORS. These Diluter Demand Regulators are torso-mounted, multi-purpose regulators. They are designed to provide 100% oxygen or an air-oxygen mixture at the correct ratio and pressure to the aircrewmember, depending on altitude and mode selection. The regulators incorporate a selector knob (or lever) for selecting the 100% OXYGEN, or DILUTER mode.

3-12. CONTINUOUS FLOW REGULATORS. Continuous Flow Regulators are used in a limited number of naval aircraft. These regulators do not satisfactorily meet all the oxygen requirements of varying degrees of aircrew activity. Continuous Flow Regulators are not authorized for use by aircrewmembers, but are authorized for passenger use.

Section 3-2. Oxygen Hazards, Safety, and Handling

3-13. GENERAL.

3-14. Personnel safety cannot be guaranteed. However, a high level of safety can be achieved if operating personnel have the proper attitude, understanding, and training. Safety regulations must be conscientiously practiced and rigidly enforced. It is the painful truth that many of these rules have been written because of the death or suffering of those who did not know them or chose to ignore them. The best assurance of personnel safety lies in the safety-education of the people themselves. If they can be made aware of the potential hazards and the means of protecting their own lives, most of them will respond in a responsible fashion. Responsibility for the safety of one's self and others cannot, however, be obtained solely with a set of written regulations. Responsibility is secured on an individual basis, in varying degrees, and is the framework for all safety-education. There would be little need for safety rules if everyone were extremely responsible and knowledgeable. Unfortunately, this is not always the case. A lack of maturity on the part of an individual, or a new or unfamiliar job assignment, working a manner contrary to the possession of such responsibility and knowledge. Safety rules, then, become a primary tool in securing safety-conscious, well-trained personnel. In many instances, safety-education is conducted on a haphazard basis and only taken seriously when required by top management. It is not uncommon for safety procedures to evolve following a serious accident which has caused injury or death. The safety of personnel can be almost assured only when there is thorough understanding of potential hazards, correct procedures and equipment are used, and the equipment is kept in good working condition.

3-15. Safety precautions presented in this Section shall be followed by all personnel responsible for handling liquid and gaseous oxygen. To ensure personal safety and the safe and efficient handling of liquid and gaseous oxygen, all personnel shall be thoroughly familiar with the hazards involved. All operations involving the handling of LOX shall be performed by two or more qualified persons, except the removal and replacement of aircraft LOX converters. The filling of LOX converters removed from the aircraft shall require two qualified persons. (Refer to Glossary for definition of Qualified Personnel.)

WARNING

Use only small amounts of oxygen cleaning compound at a time. Use in a well ventilated open space. Avoid prolonged breathing. Oxygen cleaning compound vapors are hazardous and can cause death if too much is inhaled.

NOTE

Personnel servicing gaseous oxygen systems or LOX converters and operating ground support equipment servicing and transfer units shall be qualified and licensed in accordance with OPNAVINST 4790.2 Series.

1. All AIMD oxygen shops, ashore and afloat, shall have oxygen monitors installed to ensure oxygen content in the space is maintained at a safe level (both physiological and over-enriched). Most shops have new oxygen monitor models. However, some AIMD oxygen shops may still have older oxygen monitors installed which can remain in service until receipt of the new monitor. Contact CFA at NAWCAD Lakehurst, NJ for appropriate monitor settings. Refer to NAVAIR 06-30-501 for currently authorized oxygen monitor model numbers.

2. Quality Assurance Division shall audit the oxygen shop to ensure step 1 is complied with.

3-16. SAFETY PRECAUTIONS; OXYGEN CLEANING COMPOUND MIL-C-81302.

3-17. Oxygen cleaning compound may dilute or displace oxygen below levels necessary to sustain life. Low levels are especially susceptible to oxygen displacement. The following warning shall be displayed wherever cleaning compound MIL-C-81302 is used.

WARNING

Inhaling trichlorotrifluoroethane vapor can be fatal.

Vapor concentration, immediately dangerous to life, is almost odorless, colorless, and tasteless. It may cause impairment of manual dexterity and vigilance. Breathing high concentrations may cause death or serious physical harm. In case of spill, warn other personnel and evacuate immediately.

3-18. The following precautions shall be followed by all personnel handling cleaning compound, MIL-C-81302.

1. Avoid breathing vapors. Avoid skin and eye contact.

2. Use the least amount possible to perform the task.

3. Assure good ventilation to maintain vapor levels at an acceptable level.

4. Do not wear contact lenses when using MIL-C-81302 cleaning compound.

5. Wear safety goggles for eye protection.

6. First Aid. If required, perform the following first aid procedures as necessary:

a. In case of direct contact, remove contaminated clothing and wash involved skin with soap and water. Seek medical attention if irritation occurs.

b. In case of eye contact, flush with potable water for at least 5 minutes. Call a physician.

c. If inside, remove to fresh air. If not breathing, give artificial respiration preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician. Do not give epinephrine or similar drugs.

d. If ingested, do not induce vomiting.

NOTE FOR PHYSICIAN:

Trichlorotrifluoroethane has caused cardiac sensitization to epinephrine in experimental animals (dogs). Cardiac arrhythmia, including ventricular fibrillation, could occur if epinephrine or one of its congeners is administered to patients exposed to high concentrations of trichlorotrifluoroethane. Medical use of epinephrine or any of its congeners is contraindicated except for patients with no arterial perfusion.

3-19. GASEOUS OXYGEN HAZARDS.

3-20. Gaseous oxygen is extremely hazardous when used in the presence of readily combustible materials. Do not permit oil, grease, gasoline, kerosene, aviation fuel or any other readily combustible material to come in contact with oxygen.

3-21. GENERAL SAFETY PRECAUTIONS (GASEOUS OXYGEN).

3-22. The following safety precautions shall be followed by all personnel handling gaseous oxygen:

1. Only oxygen conforming to MIL-O-27210, Type I shall be used in aircraft gaseous oxygen systems.

2. Exercise care that compressed oxygen does not become contaminated in anyway with hydrogen, hydrocarbon gases, or oil base liquids as a serious explosion can result.

3. Oil or grease must never be allowed to come into contact with or be used in the presence of open cylinders, valves, regulators, gages or fittings. Fire or explosion may result.

4. Never lubricate oxygen valves, regulators, gages, or fittings with oil or any substance except an approved oxygen compatible lubricant, listed below.

Mil Spec	Description	NIIN
TYPE III	Krytox	
TYPE III	Tribolube	16

Specific lubricants approved for use with oxygen equipment are listed in the appropriate chapter of this manual describing specific oxygen equipment.

NOTE

Krytox and Tribolube shall not be used on aluminum or magnesium fittings in applications where shear stress would be encountered.

MIL-T-27730 Teflon tape shall be used specifically as a thread sealant.

MIL-M-7866 Molybdenum Disulfide shall be used on stainless steel flared fittings and on those applications where Teflon Type MIL-T-27730 cannot be used.

5. Hands should be clean and free from oil before using oxygen equipment; do not wear greasy gloves or clothing.

6. A spark is not necessary to cause a fire or explosion. The chemical reaction of having fuel gases and oils combine with oxygen is sufficient to develop spontaneous combustion, and could cause a fire or explosion.

7. Never permit oxygen cylinders to come into contact with electrical welding circuits or apparatus.

8. Do not allow sparks or flames from welding or cutting torch or any other source to contact cylinders.

9. Never use oxygen from a cylinder without reducing the pressure through a pressure reducing regulator.

10. Never mix other gases or compressed air in an oxygen cylinder.

11. Never test for pipe line leaks or blow-out pipe lines with oxygen unless lines are specifically made and

cleaned for oxygen use. Use water-pumped nitrogen, which does not support combustion, for this purpose. Pipes, pipe threads, and other pressure containers are sometimes greased or oiled. Using compressed oxygen for the general purpose of testing for leaks is extremely dangerous and almost certain to cause a violent explosion.

12. To aid in preventing leakage or material failure due to overtorque of gaseous oxygen system tubing and fittings, strict adherence to torque values listed in table 3-1 is mandatory.

13. Do not confuse air with oxygen. Oxygen is one of several elements contained in air and should always be described by its proper name. Any attempt to use oxygen in place of compressed air may result in an accident. Never use oxygen for pneumatic tools, for starting diesel engines, as a pressure agent in oil reservoirs, for paint spraying, or for any use other than breathing, welding, or cutting.

14. Aviator's breathing oxygen supply cylinders can be readily identified by their green color and 3-inch wide white band around the upper circumference of the cylinder. OXYGEN, AVIATOR'S shall be stenciled in white parallel to the longitudinal axis and on diametrically opposed sides in letters 1 3/4 to 2 inches high.

15. Before connecting oxygen cylinders to oxygen systems, be sure that each cylinder is properly and correctly identified as containing aviator's breathing oxygen.

16. Never pressurize an oxygen system without the proper adapter and safety disc installed on the transfer line.

17. The amount of oxygen in a cylinder is determined by pressure.

18. Under no circumstances shall carbon tetrachloride or similar cleaning fluids be used. Minute quantities of these materials will contaminate the oxygen supply.

19. Do not clean any elastomer parts (rubberized) that have become contaminated with oil or grease. All such parts shall be replaced.

20. Prior to using leak detection compound (MIL-L-25567, Type 1), inspect carefully. Compound which is not clear and free from suspended material sediment is considered contaminated and shall be disposed of. Compound exhibiting peculiar odors such as acetone or alcohol is considered contaminated and shall be disposed of.

21. Use leak detection compound (MIL-L-25567, Type 1) sparingly as any solution entering oxygen equipment will contaminate the system. Remove all traces of the compound after test with a clean, damp, lint-free cloth.

22. The pressure in oxygen storage cylinders which service/replenish aircraft oxygen supply cylinders should not fall below 50 psig. Keep valve closed when not in use. Oxygen cylinders depleted to a pressure of approximately 50 psig shall be marked "EMPTY," tagged appropriately, and stored separately from charged oxygen cylinders. All cylinders which have a pressure below 15 psig shall be removed from service for vacuum and heat drying/hot nitrogen gas drying (MIL-STD-1411/MIL-STD-1359).

NOTE

A full oxygen cylinder is a cylinder which is charged to its rated pressure. With respect to a high pressure oxygen cylinder, 1800 psig is considered full.

To refill is to recharge a cylinder, regardless of the residual pressure remaining within the cylinder.

Cylinders that are less than 2 inches in outside diameter and less than 2 feet long do not require a hydrostatic retest.

Hydrostatic test interval for P-3 fixed installed oxygen cylinders (P/N 1084-514), shall not exceed eight years.

Low Pressure Oxygen Cylinders, Type MS21227-1 used on MA-1 Portable Emergency Oxygen System, do not have a Department of Transportation (D.O.T.) ICC number permanently stamped in the neck of the cylinder and therefore do not require hydrostatic testing. These cylinders are painted yellow in accordance with MIL-STD-101.

23. Never refill an oxygen cylinder that has gone beyond its hydrostatic test date (5 years after last test date stamped on cylinder shoulder). As long as the cylinder is full, it may remain in service.

24. Do not confuse aviator's breathing oxygen with welding or hospital oxygen. The latter types of oxygen usually have a moisture content that would freeze and plug the lines and valves of an aircraft oxygen system.

25. Leave cap on cylinder when not in use to protect valve. A broken valve may cause a cylinder to rocket like a torpedo, and could cause serious injury or death.

26. Before opening an oxygen cylinder valve, ensure cylinder is firmly supported. Cylinder valves are to be closed by hand only. If valve cannot be fully closed by hand, it shall be returned with cylinder for repair. A protective cap shall be installed on the valve of any cylinder not in use.

27. Open valves slowly, rapid surges in pressure can damage sensitive equipment and cause extreme temperature rise in small orifices and components.

28. Use existing or formulate charging stages when refilling oxygen cylinders and systems. Rapid pressurization creates heat which can result in fire or explosion.

WARNING

Wire-wrapped cylinders have wire-wrapping removed prior to hydrostatic testing; cylinders passing the hydrostatic test must be rewound prior to placing back in service.

NOTE

Not all cylinders require wire-wrapping. Wire wrapping is not required on 96 cubic inch cylinders manufactured under contracts N00363-78-M-7383 and N00383-77-C-2908.

29. Remove emergency oxygen cylinders or walk around bottles from aircraft for servicing.

30. Never fill aircraft systems without using a pressure reducing regulator. Aircraft have been demolished by failure to observe this precaution.

31. Ensure all oxygen equipment left outdoors is sheltered from the elements.

32. NAVSUPINST 4440.128 series contains instructions for storage, handling and hydrostatic testing intervals for compressed gases and gas cylinders.

3-23. LIQUID OXYGEN HAZARDS.

3-24. The potential hazards associated with the handling of liquid oxygen are due to its extremely cold temperature, rapid expansion upon conversion to gas at ambient (room) temperature, and its reactivity with any organic matter or flammable substance with which it comes in contact.

3-25. FREEZING. Because liquid oxygen has an extremely low temperature, it can freeze or seriously damage skin tissue upon contact. The effect is similar to frostbite or thermal burn. Use extreme caution when filling a warm container because vigorous boiling, splashing and evaporation will occur.

3-26. Metals and similar materials cooled by liquid oxygen may freeze to the skin upon contact. Flesh can be badly burned or torn in an attempt to free it. Always assume that frosted or uninsulated parts of liquid oxygen equipment are approximately -297°F (-182.7°C). Refer to Section 3-3 for protective clothing requirements.

3-27. FIRE AND EXPLOSION. Always handle liquid oxygen in well-ventilated areas. Never dispose of liquid oxygen in confined spaces. If liquid oxygen is spilled on a combustible substance, the substance will burn with great intensity if ignited.

3-28. Do not allow any organic matter or flammable substance to come in contact with liquid oxygen. Some of the materials that may react violently with oxygen under the right conditions of temperature and pressure are oil, grease, dirt containing oil or grease, tar, cotton, lamp black, coal dust, asphalt, gasoline, kerosene, JP fuel, propane, butane, naphtha, alcohol, ether, aniline, benzene, hydrogen, illuminating gas, acetylene, paint, sugar, sulfur, cloth and wood. If exposed to liquid oxygen, organic materials (such as those listed previously) will burn violently when ignited. All combustibles are potential explosion hazards when mixed with liquid oxygen. Mere mixture of liquid oxygen with powdered organic materials under certain conditions may cause explosion. If the vapor from liquid oxygen mixes with fuel vapor in the right proportions, the mixture will explode if ignited. Every fire involving liquid oxygen must therefore be regarded as an explosion hazard.

3-29. PRESSURE EXPLOSION. If liquid oxygen is vaporized and warmed to ambient temperature, one volume of liquid oxygen will expand to 862 volumes of gaseous oxygen. If this evaporation and expansion takes place in a confined space, explosive pressures in excess of 12,000 psig will be created. For this reason, all storage containers must be provided with pressure relief devices, unless the container is so vented that gas cannot be entrapped. All lines and equipment in which liquid may be trapped between closed valves must be equipped with pressure relief valves. All pressure relief valves and rupture discs must be placed and protected so that water cannot splash or condense upon them. Relief valves must be checked periodically to ensure that they are in proper operating condition.

3-30. GENERAL SAFETY PRECAUTIONS (LIQUID OXYGEN).

3-31. The following safety precautions shall be followed by all personnel handling liquid oxygen:

WARNING

Do not service LOX converters in an unsheltered area during inclement weather (rain, snow etc). Moisture can easily enter the vent port of the fill buildup vent valve and supply manifold. Moisture will freeze immediately upon contact with liquid oxygen rendering pressure closing or relief valve or both inoperative. This situation, if undetected, will lead to critical over pressurization and explosion of LOX converter:

LOX converters shall be drained in a well ventilated, clean area with limited access and protection from inclement weather so designated by type commanders or NAVSEA. A drip/drain pan with sides at least 6 inches high and free from dirt, grease, oil, fuel, hydraulic fluid, and other hydrocarbons, shall be used when draining LOX converters. Two qualified persons shall be present when draining LOX converters, one of which will be designated safety observer. A maximum of two LOX converters can be drained at one time.

1. Only liquid oxygen conforming to MIL-O-27210, Type II shall be used in aircraft liquid oxygen systems.

2. When transferring liquid oxygen or converting liquid oxygen to gaseous oxygen, the safety precautions pertaining to the handling of both liquid oxygen and gaseous oxygen apply.

3. Do not operate liquid oxygen equipment unless you are qualified or are working under the supervision of qualified personnel.

4. Wear goggles or a face shield when handling liquid oxygen.

5. Do not handle with bare hands any tubing or fittings through which liquid oxygen is flowing. Wear clean, dry gloves when handling parts of equipment cooled by liquid oxygen.

6. A rubber coated, cotton duck, impermeable apron shall be worn when working with liquid oxygen. The apron should be tied or secured in a fashion that would make it easy to remove in an emergency.

7. Cuffless coverall shall be worn. The coverall shall be worn over the gloves and the top of shoes, so that in the event of LOX spillage, the LOX will roll off the clothing and not become trapped in the gloves or boots.

8. Approved type liquid oxygen boots shall be worn.

9. In the event of accidental contact with liquid oxygen, quickly thaw the exposed area, preferably by immersion or by bathing area with large amounts of water. After the rapid thaw, wrap the exposed area loosely with clean dry dressing and report to a doctor immediately. Do not apply anything else to the affected area other than the clean dry dressing.

10. Do not permit smoking, open flames, or sparks in the liquid oxygen handling areas.

11. Do not carry matches in liquid oxygen handling areas.

12. Ensure all liquid oxygen equipment left outdoors is sheltered from the elements.

13. Keep work area and equipment free of oil, grease or any other combustible material.

14. Keep tools and clothing free of oil and grease.

15. Avoid spilling liquid oxygen on floor or deck areas. In case of accidental spillage, thoroughly ventilate the area.

16. Always call oxygen by its proper name. Do not confuse it with compressed air. Never use oxygen in place of compressed air for any purpose.

17. Handle converters, storage tanks and transfer hoses with care to avoid damage to the insulating space.

18. (Essex GCU-24/A Only) Prior to filling converter, inspect safety wire and Glyptal dots on relief valve and pressure closing valve for security.

19. When transferring liquid oxygen, do not leave valves open all the way. Open valves wide, and then immediately close them about one quarter turn; otherwise they may freeze in the open position.

20. Disconnect filling or transfer lines as soon as the transfer process is completed.

21. Do not leave liquid oxygen in a closed container, or trapped in a line between two valves; always open a valve on one end to avoid excessive pressure buildup.

22. Use only standard approved equipment in the handling and storage of liquid oxygen.

23. Do not introduce moisture into the system. Exercise care to ensure that no moisture is present on filler valve nozzles when they are connected or disconnected.

24. Purge piping and equipment with oil-free nitrogen, Type I, Class 1, Grade B, (Fed Spec BB-N-411).

25. To aid in preventing leakage or material failure due to over-torquing of liquid oxygen system tubing and fittings, strict adherence to torque values listed in table 3-1 is mandatory.

26. For additional precautions and information, refer to Technical Manual of Oxygen/Nitrogen Cryogenic Systems (NAVAIR 06-30-501).

3-32. (Converters Permanently Installed in Aircraft) Before recharging an aircraft liquid oxygen system with the converter installed, take the following precautions in addition to those already indicated. Ensure that:

1. The aircraft is in an open ventilated area.

2. The aircraft is not being fueled.

3. The aircraft is static grounded.

4. The aircraft electrical system is OFF.

5. No APUs or starting units are connected to the aircraft or are operating in the vicinity.

6. A CO_2 fire extinguisher is immediately available.

7. Personnel are kept clear of the aircraft overboard vent.

8. The deck under and in the immediate vicinity of the overboard vent is free from grease, oil, or any other combustible material.

9. A stainless steel, aluminum or copper drip pan is placed beneath the aircraft overboard vent.

3-33. (Converters Incorporating a Quick-Disconnect Mounting Plate) Converters shall be removed from aircraft prior to any servicing.

3-34. SAFETY PRECAUTIONS ABOARD SHIP. In addition to the general safety precautions, all personnel aboard ship shall follow these additional safety precautions:

Table 3-1. Torque Values for Tubing and Fittings

Torque Requirements for Flared Tube Connections (Aluminum)		
Tubing O.D. (inches)	Minimum Torque (pound-inches)	Maximum Torque (pound-inches)
5/16	100	125
3/8	200	250
1/2	300	400
Notes: Standard straight tapered pipe thread fittings have no torque values. Tape the pipe threads with two turns of teflon tape and install the fitting finger tight. Then attach wrench and tighten one to two turns maximum.		

WARNING

LOX converters shall be drained in a well ventilated, clean area with limited access and protection from inclement weather so designated by type commanders or NAVSEA. A drip/drain pan with sides at least 6 inches high and free from dirt, grease, oil, fuel, hydraulic fluid, and other hydrocarbons, shall be used when draining LOX converters. Two qualified persons shall be present when draining LOX converters, one of which will be designated safety observer. A maximum of two LOX converters can be drained at one time.

1. When smoking or when carrying an open or unshielded light or any potential spark-producing apparatus, do not enter an oxygen storage compartment. Do not approach any point where oxygen is being discharged or where there is a suspected leak in piping.

2. Exercise care in handling ammunition near oxygen.

3. Keep open flames at last 100 feet away from oxygen storage tanks or oxygen equipment.

4. Oxygen storage and handling compartments shall be sprayed with one coat of fire-resistant paint before being used. However, first remove any other existing paint from plant and equipment and thoroughly clean them to bare metal.

5. Do not permit painting when liquid oxygen is contained in the compartment.

6. During transfer operations, position the transfer trailer so that it will not shift with the pitch and roll of the ship. Lock the brakes and tie down the trailer.

7. Do not drain or vent oxygen in a closed compartment.

8. During transfer operations keep work area, equipment, tools, and clothing free from oil, grease of other hydrocarbon points.

9. Post LIQUID OXYGEN signs in a conspicuous place on all storage tanks, compartments, and handling rooms. Post CAUTION and NO SMOKING signs at entrances and hazardous points.

10. When liquid oxygen piping is not enclosed in a double wall or flame tight casing, post NO SMOKING signs in the compartments containing the piping.

3-35. STORAGE.

3-36. Liquid oxygen storage containers must be protected from excessive heat and direct rays of the sun. Liquid oxygen containers must be stored apart from containers of other gases or liquids and must not be stored within 50 feet of flammable material of any kind. Never transfer liquid oxygen in or around areas in which odors of any type may be absorbed by the liquid.

3-37. All storage containers must be provided with pressure-relief devices. These pressure-relief devices shall be checked periodically to ensure that they are in proper operating condition.

3-38. Oxygen must not be stored or used near flammable material or any substance likely to start or accelerate fire. Oxygen is not flammable, but supports combustion intensively. Store at least 50 feet from combustible materials.

3-39. Oxygen cylinders must not be stored with hydrogen or other combustible gas cylinders in an unventilated place. If stored inside, they shall be separated by a fire-resistant wall.

3-40. Do not store oxygen cylinders, LOX converters and apparatus under moving machinery, cranes, belts, or where exposed to residue from stack gasses. Oil and grease may drop and cause explosion, fire or contamination.

3-41. Gaseous and liquid oxygen servicing trailers can be stowed or parked inside enclosed buildings or hangars provided those spaces are constructed of concrete or steel and meet minimum ventilation requirements. Gaseous or liquid oxygen servicing trailers shall not be stowed or parked in enclosed wooden buildings. If approved stowage or parking facilities are not available, servicing trailers must be stowed or parked in a covered lean-to enclosed on three sides only. The lean-to should be positioned a minimum of 50 feet from traveled roadways, parking areas, and wooden structures.

3-42. LOX CONVERTER STORAGE. Liquid oxygen converters stored outdoors must be sheltered from the elements (e.g., direct rays of the sun, rain, snow, etc.), as moisture can easily enter vent or supply couplings. The moisture when frozen can render the presure closing valve or relief valve inoperative; this canlead to overpressurization and explosion of the LOX converter.

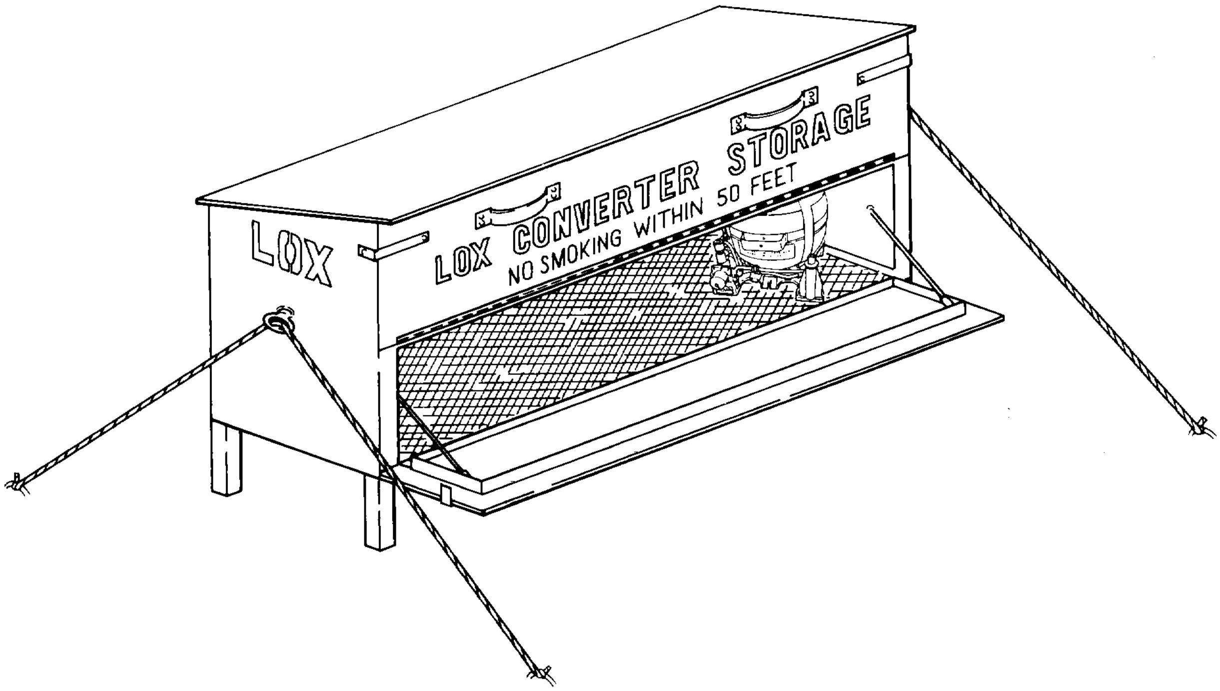

Figure 3-1. Liquid Oxygen converter Storage Shelter

3-43. Protective shelters shall be provided for LOX converters which are stored outdoors (figure 3-1). Protective shelters may be locally manufactured to suit individual activity requirements. Protective shelters shall be manufactured according to these requirements:

1. Shelters must be well ventilated to prevent the buildup of potentially dangerous concentrations of oxygen.

2. Shelters must be constructed of noncombustible materials.

3. All shelves must be constructed of expanded stainless steel wire mesh or other perforated material to provide adequate ventilation.

4. Shelves shall be no less than 17 inches high. The shelf depth shall be no less than 18 inches. The length shall be determined by the number of converters to be stored, leaving 18 inches or more for each converter. The bottom shelf must be a minimum of 10 inches above the ground.

5. Shelters shall be painted white and marked “LOX CONVERTER STORAGE” using green reflective tape L-S-300B. Letters shall be no less than 4 inches high. In addition the warning “NO SMOKING WITHIN 50 FEET” shall be marked on the shelter using red reflective tape L-S-300B. Letters shall be no less than 2 inches high.

6. The shelter shall be provided with eyebolts or handles to provide a four-point tiedown.

Section 3-3. Protective Clothing

3-44. GENERAL.

3-45. Because of the hazards associated with handling liquid oxygen, it is imperative that all personnel working with liquid oxygen wear protective clothing.

3-46. The following is a list of approved protective clothing and authorized allowance that can be used when working with liquid oxygen:

Support Equipment Required

Quantity	Description	Reference Number
1 ea per individual	Apron, Impermeable, Cotton Duck, Rubber Coated	MIL-A-41829 (CAGE 81349) NIIN 00-082-6108
1 ea per individual	Face Shield, Industrial, Style B	L-F-36 (CAGE 81348) NIIN 00-202-9473
2 ea per individual	Coveralls, Explosive Handlers	MIL-C-14610 (CAGE 81349)
	X Small (32-34)	NIIN 00-279-2455
	Small (36-38)	NIIN 00-279-8719
	Medium (40-42)	NIIN 00-279-8720
	Large (44-46)	NIIN 00-279-8721
	X Large (48-50)	NIIN 00-279-8722
1 ea per individual	Shoe, Molders	MIL-S-82245 (CAGE 81349)
	7D	NIIN 00-926-9965
	7EE	NIIN 00-926-9966
	8D	NIIN 00-926-9967
	8EE	NIIN 00-926-9968
	9D	NIIN 00-926-9969
	9EE	NIIN 00-926-9970
	10D	NIIN 00-926-9971
	10EE	NIIN 00-926-9972
	11D	NIIN 00-926-9973
	11EE	NIIN 00-926-9974

Support Equipment Required (Cont)

Quantity	Description	Reference Number
1 pr per individual	Gloves, LOX Servicing (Note 1)	(CAGE 65370)
	Medium	LOX-MIL-M
	Large	LOX-MIL-L
	X-Large	LOX-MIL-XL

Notes: 1. LOX Servicing Gloves are not currently stocked in the Navy Supply System and must be ordered Open Purchased from the following vendor:
Tempshield Inc.
23 Industrial Way
Trenton Business Park
Trenton, Maine 04605
TEL: (800) 680-2796

1. Face Shield/Safety Goggles. Eye protection shall be worn at all times when working with liquid oxygen. When working in confined areas or overhead, wear face shield or safety goggles to protect the eyes. Safety glasses with side shields may also be used.

2. Always wear LOX servicing gloves when handling any equipment that is or may have been in recent contact with liquid oxygen. Gloves shall be loose fitting so that they can be quickly removed if LOX gets into them. In addition use protective gloves when handling purging units.

3. Coverall, explosive ordnance handlers, cotton sateen, fire resistant shall be used by liquid oxygen handlers. Cuffless sleeves and trouser legs shall be worn over the top of gloves and shoes.

4. Apron, impermeable, cotton duck, rubber coated, shall be worn when working with liquid oxygen. The apron shall be tied or secured in a fashion that would make it easy to remove in case of an emergency.

5. Shoes, LOX boots (shoes, safety, molders, congress style, black) a type that can be easily removed, shall be worn when working with liquid oxygen.

6. Clothing that is splashed by liquid oxygen shall be removed immediately and thoroughly aired for at least 1 hour.

Section 3-4. Aircraft Oxygen System Requirements

3-47. GENERAL.

3-48. Aircraft oxygen systems shall be purged when the system is left open to the atmosphere, when empty, or whenever contamination is suspected.

3-49. When maintenance action involves the removal and reinstallation of connecting hardware without a change in adjustment or alignment to the system, a thorough ground functional check shall be conducted prior to the aircraft being released for flight. (Refer to OPNAVINST 4790.2 Series.)

WARNING

Only clean plastic caps or plugs (MIL-C-5501) shall be used to close oxygen system openings. Under no circumstances will tape, rags, or paper be used to close openings created by removal of components.

3-50. When an aircraft oxygen system is opened for the removal/replacement of any component, all openings created shall be immediately plugged or capped to prevent entrance of moisture or contaminants.

3-51. PURGING OXYGEN SYSTEMS.

3-52. The following Materials Required, Support Equipment, and procedures shall be followed when purging oxygen systems:

Materials Required

Quantity	Description	Reference Number
As Required	Nitrogen, Oil-free, Water Pumped, Type I, Class I, Grade B	Fed Spec BB-N-411 NIIN 00-985-7275

Support Equipment Required

Quantity	Description	Reference Number
1	Gas/LOX Purging Unit, Model A/M26M-3	3447AS100-1

3-53. PURGING LOW-PRESSURE OXYGEN SYSTEMS. Low-pressure gaseous oxygen systems shall be purged by one of the following methods:

1. Aircraft having filler and distribution lines connected to the same end of the cylinder shall be purged by charging the system with gaseous oxygen; then by depleting. Perform this procedure a minimum of three times.

WARNING

Use only oil-free nitrogen, Type I, Class 1, Grade B for purging oxygen systems. The use of aircraft nitrogen servicing trailers for purging oxygen systems is strictly prohibited. For oxygen test stands and purging equipment, use only nitrogen from gray cylinders marked NITROGEN OIL FREE in white letters. Two 3-inch wide black bands mark the tops of these cylinders.

2. Aircraft having the filler valve connected to one end of the cylinder and distribution lines to the opposite end (i.e., continuous flow system) shall be purged as follows:

a. Connect purging unit (P/N 3447AS100-1) to aircraft filler valve.

b. Disconnect regulator distribution line(s) at regulator(s) to permit a flow.

c. Pass heated oil-free nitrogen through system at maximum pressure of 120 psig and a minimum temperature of 90°F for 30 minutes. Create a flow through the system. This can be accomplished by various methods, depending on the type of aircraft system. Consult the applicable aircraft MIM for detailed instructions. If moisture or contaminants are still present, repeat purge as required.

d. Disconnect purging unit. Reconnect regulator(s) and recharge system with oxygen.

e. Drain system through regulator(s) to remove any residual nitrogen.

f. To complete purge, recharge system with oxygen.

3-54. PURGING HIGH-PRESSURE OXYGEN SYSTEMS. Two factors must be considered when purging high-pressure oxygen systems: purging for the removal of contamination or purging for the removal of moisture.

3-55. To purge a high-pressure oxygen system of contamination, proceed as follows:

NOTE

It can never be certain that moisture is not present. Therefore, the following purge procedures should only be used in emergency situations where the procedures outlined in paragraph 3-56 can not be accomplished.

1. Charge system with gaseous oxygen; then drain system through regulator(s).

2. Repeat step 1 a minimum of two times.

3. To complete purge, recharge system with oxygen.

3-56. To purge a high-pressure oxygen system of moisture, proceed as follows:

WARNING

Cylinders which have been open to the atmosphere and voided of oxygen (to less than 15 psig) shall be removed from service for vacuum and heat drying/hot nitrogen gas drying (MIL-STD-1411 and MIL-STD-1359A) before recharging.

Use only oil-free nitrogen, Type I, Class 1, Grade B (Fed Spec BB-N-411) for purging oxygen systems. The use of aircraft nitrogen servicing trailers for purging oxygen systems is strictly prohibited. For oxygen test stands and purging equipment, use only nitrogen from gray cylinders marked NITROGEN OIL FREE in white letters. Two 3-inch wide black bands mark the tops of these cylinders.

1. (Manually Operated Cylinder Valve) Close cylinder valve; disconnect supply line at cylinder.

2. (Automatic Opening Cylinder Valve) Disconnect supply line at cylinder.

3. Disconnect regulator distribution line(s) at regulator(s) to permit a flow.

4. Connect purging unit (P/N 3447AS100-1) to aircraft filler valve and pass a flow of heated oil-free nitrogen (Fed Spec BB-N-411) through system at maximum pressure of 120 psig and a minimum temperature of 90 °F for 30 minutes. Create a flow through the system. This can be accomplished by various methods, depending on the type of aircraft system. Consult applicable aircraft MIM for detailed instructions. If moisture or contaminants are still present, repeat purge as required.

5. When purging is completed, disconnect purging unit, reconnect all lines, and open cylinder valve (if applicable).

6. Functionally test system in accordance with applicable Maintenance Instruction Manuals (MIMs).

3-57. PURGING AIRCRAFT LIQUID OXYGEN SYSTEMS. To purge aircraft liquid oxygen systems, proceed as follows:

WARNING

Use only oil-free nitrogen, Type I, Class 1, Grade B (Fed Spec BB-N-411) for purging oxygen systems. The use of aircraft nitrogen servicing trailers for purging oxygen systems is strictly prohibited. For oxygen test stands and purging equipment, use only nitrogen from gray cylinders marked NITROGEN OIL FREE in white letters. Two 3-inch wide black bands mark the tops of these cylinders.

1. Disconnect and, if necessary, remove LOX converter.

2. Connect purging unit (P/N 3447AS100-1) to aircraft system supply quick-disconnect.

3. Create a flow at user end of system. This can be accomplished by various methods, depending on type of aircraft system. Consult applicable MIM for detailed instructions.

4. Pass heated oil-free nitrogen (Fed Spec BB-N-411) through system at maximum pressure of 120 psig and a minimum temperature of 90°F for 30 minutes. If contaminants are still present, repeat purge as required.

5. When purging is completed, disconnect purge unit. Reconnect aircraft system supply quick-disconnect to LOX converter.

6. Fill aircraft system if applicable. Functionally test system in accordance with applicable MIM.

3-58. LOX CONVERTER MAINTENANCE.

3-59. QUICK-DISCONNECT CONVERTERS. A Calendar Inspection, consisting of a Visual Inspection followed by a Bench Test, shall be performed on all LOX converters incorporating a quick-disconnect mounting plate prior to being placed in service, and at intervals not exceeding 231 days thereafter. The Calendar Inspection shall be performed in accordance with the chapter in this manual, or the technical manual pertaining to the specific type and part number LOX converter to be serviced. These converters shall be removed from aircraft prior to servicing.

3-60. PERMANENTLY INSTALLED CONVERTERS. A Calendar Inspection shall be performed on all permanently installed LOX converters in accordance with the technical manual pertaining to the specific type and part number LOX converter to be serviced. These converters shall undergo bench testing during the Standard Depot Level Maintenance (SDLM) of the aircraft in which it is installed.

3-61. PURGING LOX CONVERTERS. LOX converters shall be purged when they have been emptied, or whenever moisture or contamination is suspected. Purging shall also be performed upon completion of any maintenance action which causes the system to be open to the atmosphere. In no case shall purge interval exceed 231 days. Purging of LOX converters shall be performed in accordance with the applicable chapter of this manual. To purge LOX converters not included in this manual, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Nitrogen, Oil-free, Water Pumped, Type I, Class I, Grade B	Fed Spec BB-N-411 NIIN 00-985-7275

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Gas/LOX Purging Unit, Model A/M26M-3	3447AS100-1

WARNING

Liquid oxygen converters shall be emptied of LOX and allowed to warm to ambient temperature prior to purging.

1. Connect purging unit to vent port of fill, buildup, and vent valve.

2. Attach adapter assembly to fill port of fill, buildup, and vent valve. Turn knurl knob clockwise until it seats and then back out counterclockwise two complete turns.

3. Attach converter drain line to converter supply quick-disconnect coupling.

NOTE

For ARO Corporation converter P/N 21170-10/-13 remove relief valve tubing and cap the two fittings that tubing was removed from.

4. Pass heated oil-free nitrogen through the converter at a pressure of 120 psig and a minimum discharge temperature of 90°F. Duration of purge is dependent on converter type. Purge duration is as follows:

NOTE

For converters that indicate internal probe shortage it may be necessary to purge the converter for a longer period of time.

a. Essex Industries Inc. converters P/N 10C-0016-10A and 10C-0016-16 and Bendix Corporation P/N 29073-D2, 3263004-0201, and 3263006-0101 which are at ambient temperature shall be purged for a period of 30 minutes.

b. ARO Corporation converters P/N 21170-10/-13 which are at ambient temperature shall be purged for a period of 60 minutes.

5. When purging is completed, disconnect purging unit and bench test the converter.

Section 3-5. Oxygen System Components Maintenance Shop

3-62. GENERAL.

3-63. During the evolution of cleanliness requirements for oxygen systems, additional requirements have been generated. This has occurred partly because applications vary in scope from industrial use with the least stringent requirements, to manned space vehicles with the most demanding requirements. The major difference between aerospace cleanliness and industrial cleanliness is that the former eliminates airborne contaminants. Therefore, the aerospace industry requires particle count, white rooms and deionized water. These tiny particles are not considered significant contaminants by the oxygen industry. The exclusion of airborne particles is an extremely costly process requiring pressurized rooms, expensive filtration equipment and elaborate procedures. The AIMD/depot level cleanliness standards need not be of clean room quality, but an enclosed, air-conditioned clean area, segregated from contaminant-producing operations shall be considered adequate.

3-64. Shore-based operational facilities shop design criteria are presented is the Naval Facilities Engineering Command Design Manual (NAVFAC DM-24). Deviations from NAVFAC DM-24 shall not be made without prior approval of Naval Facilities Engineering Command Headquarters (NAVFAC HQ). See figure 3-2 for typical shore-based facility.

3-65. The climate control system must be able to maintain a temperature of 65° to 75°F. Oxygen facilities without LOX generating equipment may be heated by unit heaters (steam), or direct-fuel heaters employing an air distribution duct system, providing the heating unit is not located in the transfer shop. Oxygen facilities with Lox generating equipment may be heated by a central heating plant, or by electric heat. Open-fired heaters shall not be used.

3-66. VENTILATION.

3-67. All air supplied to a shop where gaseous or liquid oxygen/nitrogen is transferred from one unit to another shall be exhausted directly to the atmosphere. Under no circumstance shall the exhaust air be returned to the oxygen/nitrogen transfer area.

3-68. Ventilation shall be provided in LOX converter and oxygen components shop to prevent accumulation of potentially dangerous concentrations of oxygen or nitrogen. Mechanical exhaust fans capable of providing a minimum of 3 air changes per hour shall be used as a positive means of exhausting the air. Although oxygen is about 10 percent denser than air, it is not necessary to evacuate the air near the floor because oxygen rapidly diffuses into air.

3-69. Ventilation requirements for oxygen shops aboard ship that support OBOGS systems only, require only 2.0 air changes per hour. However those spaces must meet required safety standards when working with hazardous materials such as oxygen cleaning compound (MIL-C-81302), toluene, acetone and other materials associated with the repair and cleaning of OBOGS components.

3-70. ELECTRICAL.

3-71. All electrical wiring and electrical equipment shall be in accordance with NAVFAC Specification 9Y (latest revision). The following information has been extracted from this specification:

1. Rigid conduit shall be used in wiring installations.

2. Electrical receptacles on the outside of buildings shall be weatherproof, 250V ac, 20 ampere (minimum), 3-wire grounding-type, and shall be furnished with plugs. Receptacles shall be connected to 220V ac, single phase service.

3. Lighting fixtures may be standard type, except that where exposed to mechanical damage, a suitable guard or cover shall be provided.

4. Switches and motor starting shall be enclosed and of the general use type.

5. Motors shall be of a type that do not have arcing or contact making parts. Three-phase motors of squirrel cage type shall be used wherever possible.

6. All equipment shall be static-grounded.

7. Transformer banks shall be located a minimum of 50 feet from transfer shop or LOX storage tank areas.

3-72. INTERIOR FINISHING AND FIXTURES.

3-73. FLOORS. In shops where gaseous oxygen transfer operations are conducted, a concrete floor or vinyl-type floor covering is considered adequate. In shops where LOX transfer operations are conducted, the floor shall be concrete. Non-glazed, or rough-glazed ceramic tile is also a suitable floor finish.

3-74. WALLS. The walls shall be finished with a smooth, impact-resistant, non-chipping, non-flaking material.

3-75. CEILINGS. The ceilings shall be easily cleanable, non-dust accumulating acoustical-type material.

3-76. WORK BENCHES, TABLES AND STORAGE BINS. Work benches and table tops shall be of seamless, non-porous material free of hydrocarbon finishes. Color shall be in contrast to walls and ceilings to minimize eye fatigue. Storage bins shall not contain more than the required parts to maintain an orderly production rate. Work benches, tables and storage bins shall be maintained free of grease, oil and other combustible materials.

3-77. TOOLS.

3-78. All tools and equipment shall be maintained free of grease, oil and other combustible materials. Tools used on oxygen equipment shall not be used for any other purpose. Tools shall be marked OXYGEN USE ONLY, or other suitable methods of identification may be used.

3-79. WORK AREA CLEANLINESS.

3-80. Work areas shall be kept clean at all times. Dust and dirt removal shall be accomplished by a vacuum system at any time that dust is evident at any location in the work area. Damp mopping will be used to follow up the vacuum cleaning for dirt and dust removal. Heel and chair marks or other discolorations of the floors shall be removed by scrubbing. All spare parts shall be removed from the work benches or covered with a lint free covering at the end of the last work shift each day. Work benches and test equipment will be wiped clean prior to the start of each work day. Smoking, refreshments, or lunch containers of any kind shall not be permitted in the work area. Only ball type pens are permitted for use in the shop (no lead or erasures).

3-81. PERSONAL CLEANLINESS.

3-82. Solvent contact with the skin should be avoided where possible. Finger nail polish shall be removed prior to entering shop. Cosmetics and medication which may produce contamination shall not be worn by any personnel. In particular, eye makeup, rouge, face powder and hair spray shall be avoided. Under no conditions will makeup be applied in the shop area. Personnel with skin and/or upper respiratory diseases shall not be allowed to work in the overhaul shop area. Personnel with colds, temporary coughing, sneezing and severe sunburn shall be assigned temporary jobs outside the shop until they are sufficiently recovered.

3-83. QUALITY ASSURANCE.

3-84. Long, trouble-free service can only be expected when cleanliness in the shop is maintained. Frequent Quality Assurance inspections are required to ensure proficiency in work performed by shop personnel, and that cleanliness is maintained.

3-85. TRAINING.

3-86. Shop supervisors shall be responsible for conducting a continuing training program stressing the significance of oxygen system cleanliness, personal cleanliness and the oxygen safety program. Conscientious adherence to all cleanliness requirements and safety regulations shall be observed at all times.

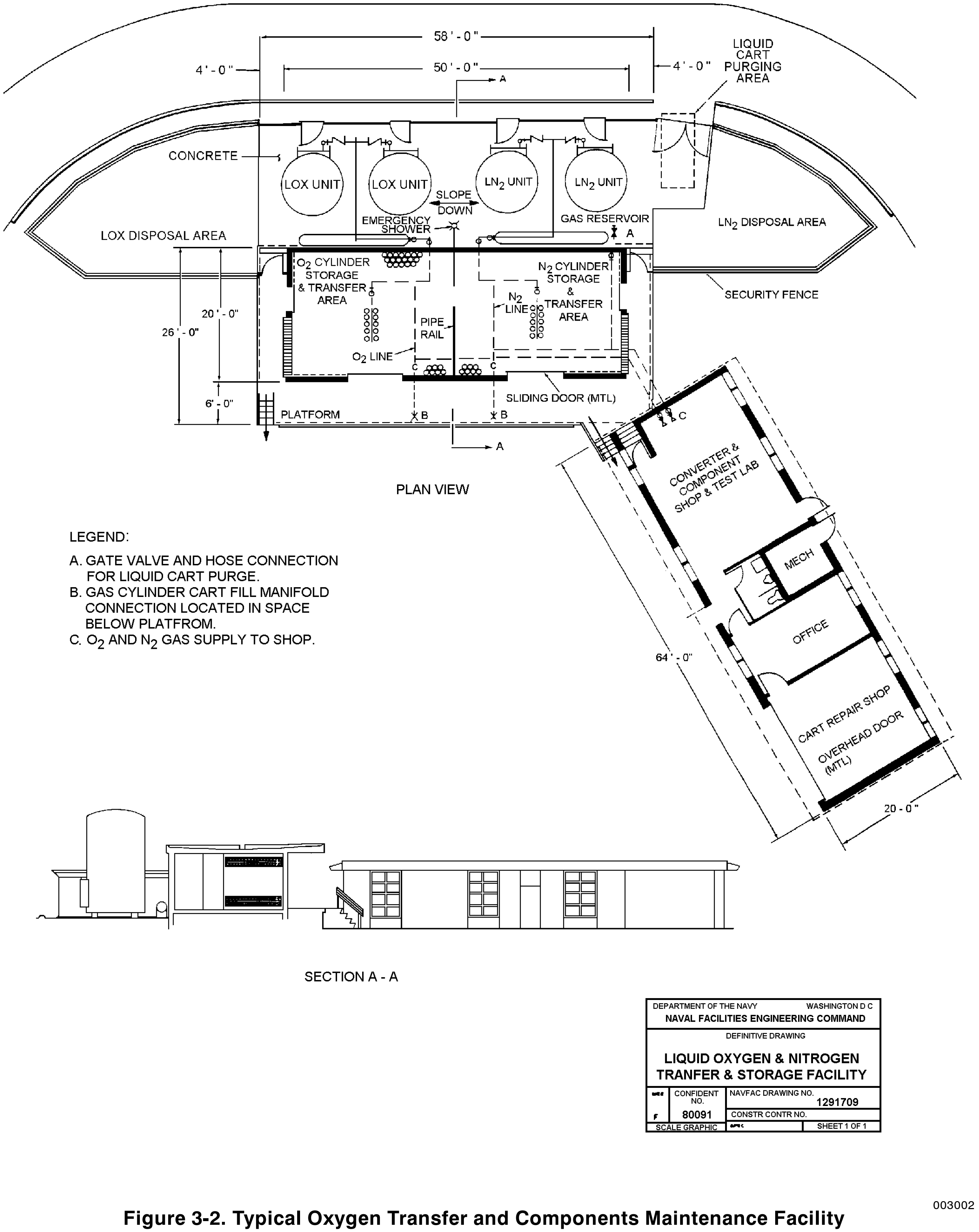

Figure 3-2. Typical Oxygen Transfer and Components Maintenance Facility

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CHAPTER 4

LIQUID OXYGEN CONVERTER ASSEMBLY

TYPE GCU-24/A, P/N 10C-0016-10A

Section 4-1. Description

4-1. GENERAL.

4-2. The Liquid Oxygen Converter Assembly, Type GCU-24/A, P/N 10C-0016-10A, (figure 4-1) is manufactured by Essex Industries, Inc. (CAGE 83533). The converter assembly is designed to store and convert liquid oxygen (LOX) into gaseous oxygen for the aircrewman during flight. Table 4-1 contains the leading particulars for the converter assembly.

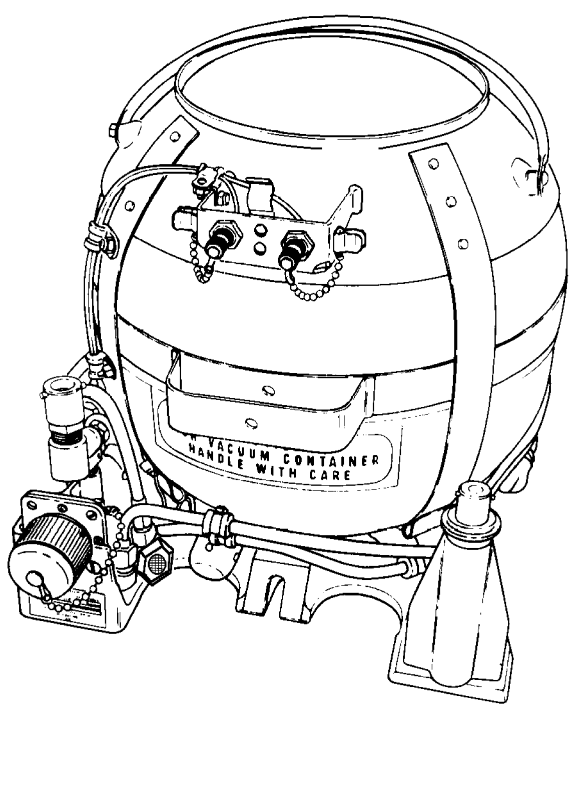

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Figure 4-1. Liquid Oxygen Converter Assembly, Type GCU-24/A, P/N 10C-0016-10A

Table 4-1. Leading Particulars

Capacity (LOX)	10 liters
Operating pressure	55 to 90 psig
Operating temperature range	-65°F (-54°C) to +260°F (+127°C)
Relief valve setting	100 to 120 psig
Pressure closing valve setting	55 to 90 psig
Delivery rate	120 lpm (min)
Filling time at 70°F	10 min
Buildup time (max)	5 min
Burst disc rupture range	225 psig at 72°F

4-3. Oxygen in its liquid state (approximately -297°F (-182°C)), is stored in a spherical assembly consisting of inner and outer shells separated by an annular space. The annular space is evacuated, creating a vacuum, preventing the transmittal of heat through the space. The thermos bottle effect created retards heating and eventual conversion of LOX to gaseous oxygen. Valves, tubing and fittings incorporated in the converter assembly converts LOX to gas and directs its flow at a controlled rate.

4-4. CONFIGURATION.

4-5. The Liquid Oxygen Converter Assembly, Type GCU-24/A, P/N 10C-0016-10A, consists of a sphere assembly, buildup and vent valve, relief valve, pressure closing valve and associated tubing and fittings. A capacitance-type probe assembly, which sends an electrical signal to a liquid oxygen quantity gage located in the aircraft, is incorporated within the sphere assembly. The quantity gage indicates the amount of LOX, in liters, contained in the converter.

4-6. FUNCTION.

4-7. Operational characteristics and performance for which the GCU-24/A converter assembly (P/N 10C-001610A) are designed are as follows:

1. Filling the converter is accomplished by attaching the LOX servicing trailer filler valve to the filler port of the fill, buildup and vent valve on the converter. When attached, the servicing trailer filler valve depresses the nosepiece and valve poppet of the fill, buildup and vent valve. This automatically puts the converter into the fill mode (figure 4-2).

2. With the poppet depressed, the fill and vent ports of the valve are opened, and the buildup port is closed. This condition allows gas pressure built up in the inner sphere to vent to the atmosphere. As pressure is vented, LOX in the servicing trailer (which is at a greater pressure (30 psig)), flows through the fill, buildup and vent valve and into the converter.

3. As the LOX level rises in the sphere, pressure created by vaporization of liquid due to heat, turbulence, etc, is vented to the atmosphere. The converter is considered full when LOX flows in a steady stream from the overboard vent line quick-disconnect.

4. When the converter is full and the servicing trailer filler valve is disconnected, the nosepiece and poppet of the fill, buildup and vent valve return to the extended position (figure 4-3). This automatically puts the converter into the buildup and supply mode by closing the fill and vent ports of the valve, and opening the buildup port.

5. In the buildup and supply mode (figure 4-3), LOX is forced out of the bottom of the inner sphere and into the buildup coil by the weight of the liquid. As the LOX warms and vaporizes into gaseous oxygen in the buildup coil, pressure is created. This pressure is controlled at approximately 75 psig by the opening and closing action of the pressure closing valve.

6. Gaseous oxygen travels from the buildup coil through the supply quick-disconnect and the heat exchanger to a shut-off valve in the aircraft cockpit.

7. Gaseous oxygen, under pressure, also passes through the gas and buildup ports of the fill, buildup and vent valve to the upper portion of the pressure closing valve, within which is a bellows. This bellows holds the valve in the open position. As pressure builds, the bellows, which senses the increase, contracts (at approximately 75 psig), and closes the valve.

8. Without a demand being placed on the converter, pressure continues to slowly rise. If allowed to go unchecked, pressure in excess of 12,000 psig could be generated. To prevent this potentially hazardous situation, a relief valve is incorporated. The relief valve is set to relieve excess pressure in the converter assembly at approximately 110 psig. As an added safety factor, a burst disc has been installed at the gas port of the fill, buildup, and vent valve (figure 4-2). The burst disc is designed to rupture at 225 psig at 72°F to relieve excess pressure in the event of relief valve or other related converter malfunction.

9. As a demand is placed on the converter by the aircrewmember, LOX is forced into the buildup coil to replace consumed oxygen. As this process is repeated, the LOX level in the converter drops, increasing the void area at the top. As the size of the void area increases, pressure decreases, and is sensed by the bellows in the pressure closing valve. When pressure falls below approximately 75 psig, the bellows expands, opening the valve. With the valve open, pressure from the buildup coil passes through the valve and into the top of the converter. This pressure, compound with the pressure created by vaporizing LOX contained in the converter, again builds to approximately 75 psig and closes the pressure closing valve. This process is repeated as long as a demand is being placed on the converter.

10. A heat exchanger is incorporated into the aircraft tubing to further warm the gaseous oxygen to a breathable temperature.

11. An additional relief valve, set at approximately 115 psig, is installed in the aircraft oxygen plumbing to provide additional protection against over pressurization of the converter and supply lines of the system.

4-8. SERVICE LIFE.

4-9. Liquid oxygen converters shall remain in service as long as they continue to function properly.

4-10. REFERENCE NUMBERS, ITEMS AND SUPPLY DATA.

4-11. Section 4-5, Illustrated Parts Breakdown, contains information on the converter assembly, subassemblies and component parts. Figure and index numbers, reference or part numbers, description, and units per assembly are provided with the breakdown.

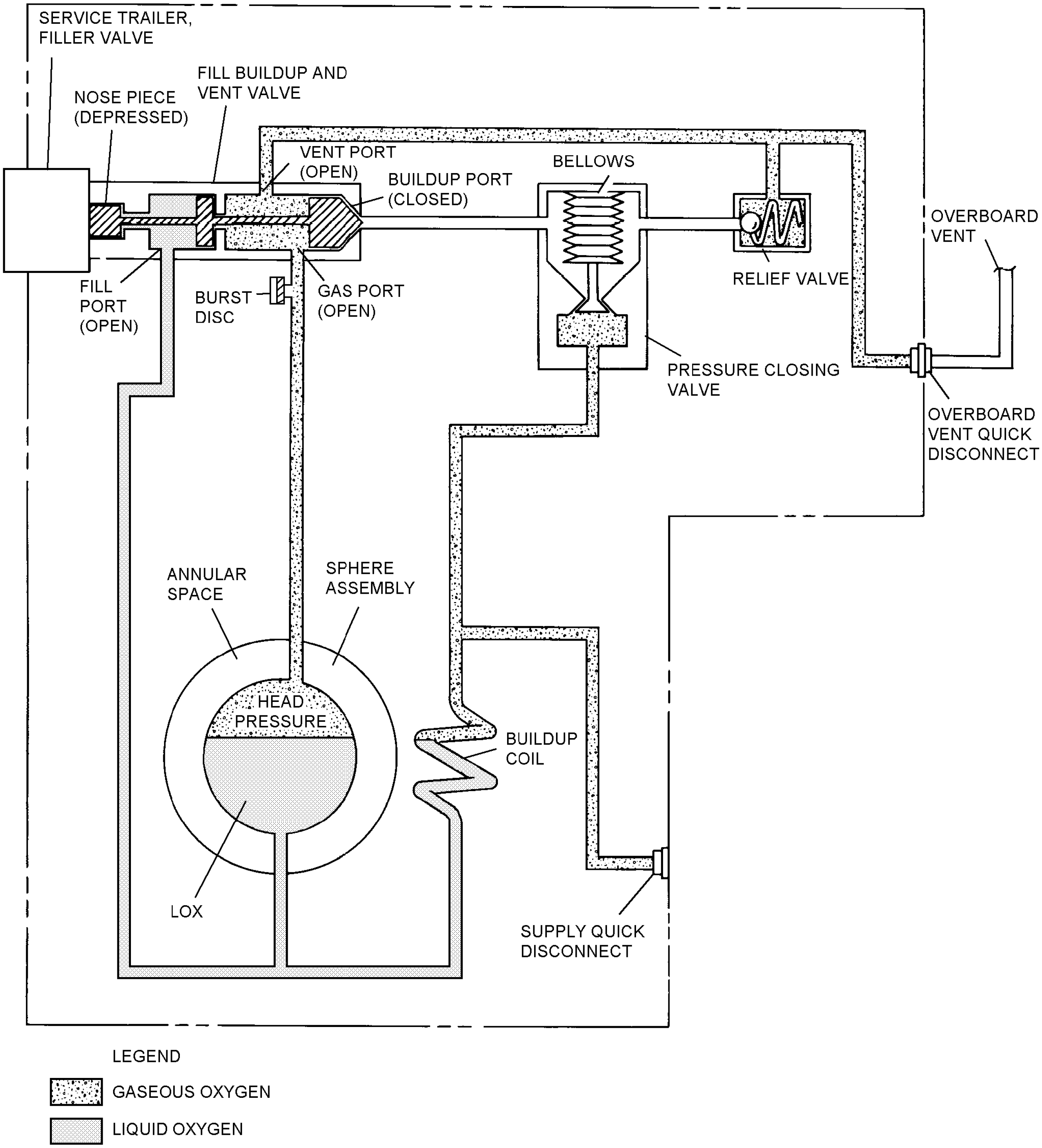


Figure 4-2. Fill Mode (Converter Removed from Aircraft)

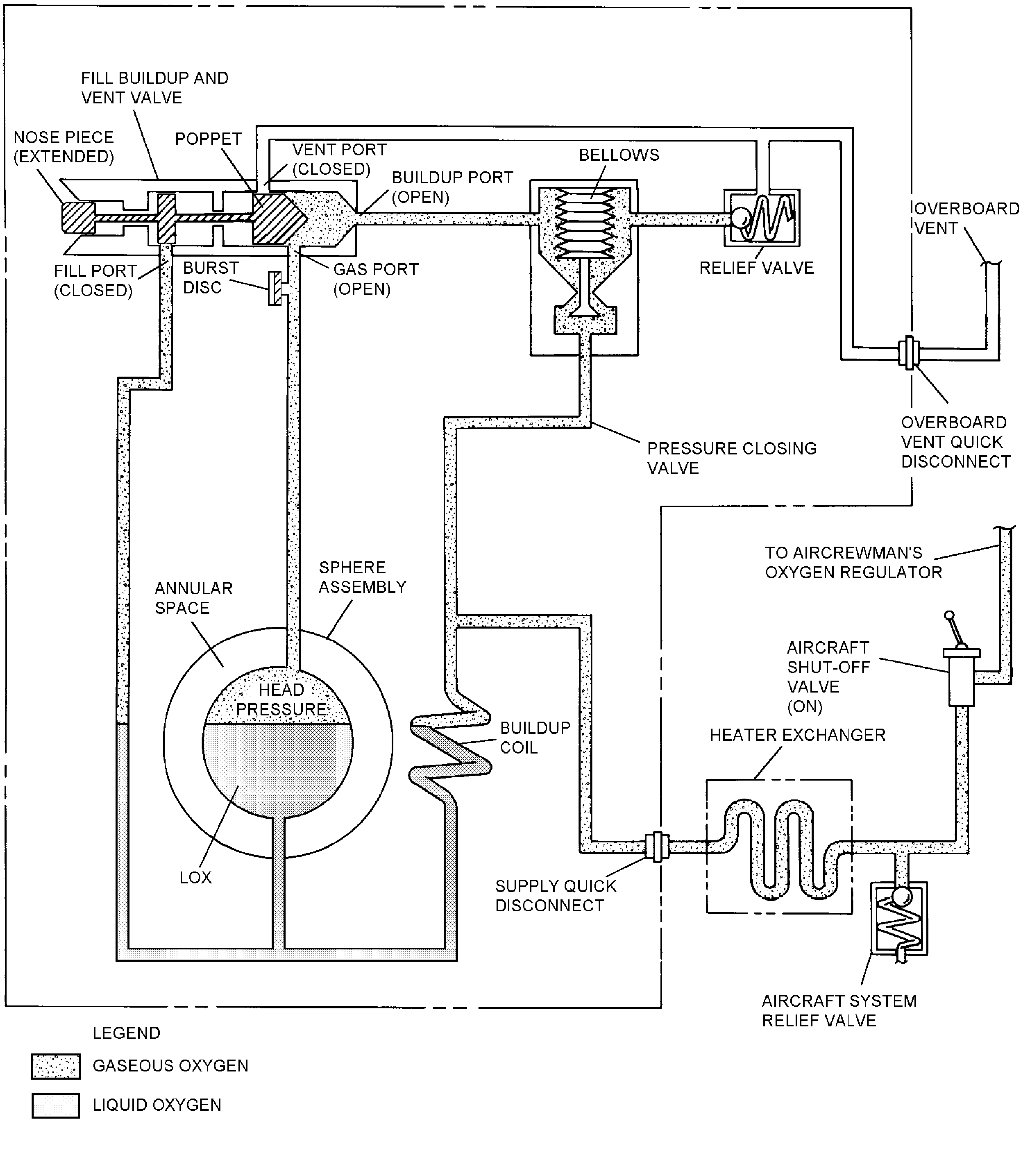


Figure 4-3. Buildup and Supply Mode (Converter Installed)

Section 4-2. Modifications

4-12. GENERAL.

4-13. Aircrew Systems Change No. 476 is incorporated to document the installation of Burst Disc Assembly 10C-0016-0061 as an added safeguard against over pressurization of Liquid Oxygen Converter (P/N 10C-0016-10A).

Section 4-3. Performance Test Sheet Preparation

4-14. GENERAL.

4-15. Preparation of the Liquid Oxygen Converter Performance Test Sheet (figure 4-4) utilized during bench test requires entering the appropriate indicated flows and pressures in the spaces provided. The indicated flows and pressures shall be extracted from the test stand calibration correction cards. Refer to appropriate ground support equipment manual.

4-16. The test stand calibration correction cards contain all actual flows and pressures required to test all known models of liquid oxygen converters presently in service. Converting actual flows and pressures to indicated flows and pressures is normally accomplished during calibration of the test stand. Refer to appropriate ground support equipment manual for calibration intervals.

4-17. The Performance Test Sheet shall be prepared as shown in figure 4-4. The Performance Test Sheet shown is a sample, but may be reproduced for local use.

4-18. The following tests require the extraction of appropriate indicated flows and/or pressures from the test stand calibration correction cards:

1. Relief Valve Test
2. Converter Leakage Test
3. Fill and Buildup Time Test
4. Flow Test
5. Converter Charge

NOTE

For correction card numbers refer to appropriate ground support equipment manual.

4-19. CONVERTER PERFORMANCE TESTS.

4-20. RELIEF VALVE TEST. The relief valve shall vent at least 100 liters per minute (lpm) with an applied pressure of 100 to 120 psig. The maximum allowable leakage with 95 psig applied is 0.01 lpm. Make the following entries on the Performance Test Sheet:

1. Locate the indicated inches of water (inH_2O) for 100 lpm on correction card number 4. Enter indicated inH_2O in space provided on Performance Test Sheet.

2. Locate the indicated psig for the actual pressures of 95, 100 and 120 psig on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

3. Locate the indicated inH_2O for the actual flow of 0.01 lpm on correction card number 7. Enter the indicated inH_2O in space provided on Performance Test Sheet.

4-21. CONVERTER LEAKAGE TEST. The Converter Leakage Test is performed with the converter pressurized with gaseous oxygen to 95 psig. Locate the indicated psig for the actual 95 psig on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

REGULATOR PERFORMANCE TEST SHEET
TYPE GCU-24/A LIQUID OXYGEN CONVERTER ASSEMBLY
(ESSEX CRYOGENICS P/N 10C-0016-10A)

DATE: ____________ CONVERTER SERIAL NO: ____________ TEST STAND SERIAL NO: ____________

OPERATOR: ____________ CDI: ____________ TARE WEIGHT: ____________

1. CONVERTER PURGE (PURGE 30 MINUTES AT 200°F (93°C) TO 250°F (121°C) AND AT 120 PSIG).

2. INSULATION RESISTANCE TEST (EMPTY).

CONNECTION	MINIMUM ALLOWABLE MEGOHMS	READING
A TO B	2.0	
A TO GROUND	1.0	
B TO GROUND	1.0	

3. CAPACITANCE TEST (EMPTY) READING SHALL BE 121.5 TO 125.5 MICROMICROFARADS (UUF) ____________

4. RELIEF VALVE TEST

<table>
<tr><th colspan="6">VENT FLOW</th><th colspan="6">LEAKAGE</th></tr>
<tr><th colspan="3">INLET PRESS (PSIG)</th><th colspan="3">FLOW</th><th colspan="3">INLET PRESS (PSIG)</th><th colspan="3">FLOW</th></tr>
<tr><th>ACTUAL</th><th>INDICATED</th><th>PG-1 READING</th><th>ACTUAL (LPM)</th><th>INDICATED (INH$_2$O)</th><th>PG-2 READING</th><th>ACTUAL</th><th>INDICATED</th><th>PG-1 READING</th><th>ACTUAL (LPM)</th><th>INDICATED (INH$_2$O)</th><th>PG-2 READING</th></tr>
<tr><td>100</td><td></td><td rowspan="2"></td><td rowspan="2">100</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2">95</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2">0.01</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>120</td><td></td></tr>
</table>

5. CONVERTER LEAKAGE TEST

95 PSIG ACTUAL = ____________ PSIG INDICATED, WITH INDICATED PSIG APPLIED THERE SHALL BE NO LEAKAGE FROM THE PRESSURE CONTROL VALVE, BUILDUP COIL, TUBING AND FITTINGS.

6. FILL AND BUILDUP TIME TEST

A. FILL TIME (MAXIMUM TIME ALLOWED IS 10 MINUTES) ____________

B. BUILDUP TIME (MAXIMUM TIME TO BUILDUP TO 55 TO 90 PSIG IS 5 MINUTES) PSIG ACTUAL = ______ PSIG INDICATED TIME REQUIRED FOR BUILUP ________ MINUTES.

7. CAPACITANCE TEST (FULL)

TOTAL CONVERTER WEIGHT	
CONVERTER TARE WEIGHT	
LOX WEIGHT (W)	
2.33 X W + 124.7 = C (MAX)	
2.25 X W + 122.3 = C (MIN)	
READING	
C = CAPACITANCE IN UUF	W = WEIGHT OF LOX IN POUNDS

Figure 4-4. Converter Performance Test Sheet (Sheet 1 of 2)

8. FLOW TEST (120 LPM WHILE MAINTAINING 55 TO 90 PSIG WORKING PRESSURE)

WORKING PRESS. (PSIG)		FLOW (LPM)		PG-1 READING
ACTUAL	PG-1 INDICATED	ACTUAL	INDICATED	
55		120		
90				

9. EVAPORATION LOSS TEST (BUILDUP AND SUPPLY MODE) MAXIMUM ALLOWABLE LOSS OF LOX IN 24 HOURS IS 3.0 LBS.

NOTE: LOX IN CONVERTER MUST BE STABILIZED FOR 1 HOUR PRIOR TO BEGINNING TEST. DO NOT AGITATE CONVERTER DURING 24 HOUR PERIOD.

A. START TIME ____________________ START WEIGHT ____________________

B. FINISH TIME ____________________ FINISH WEIGHT ____________________

10. EVAPORATION LOSS TEST (VENTED MODE)
MAXIMUM ALLOWABLE LOSS OF LOX IN 24 HOURS IS 5.0 LBS. (PERFORMED ONLY IF CONVERTER FAILS EVAPORATION LOSS TEST IN BUILDUP AND SUPPLY MODE)

A. START TIME ____________________ START WEIGHT ____________________

B. FINISH TIME ____________________ FINISH WEIGHT ____________________

11. CONVERTER CHARGE (OXYGEN)

PRESSURE (PSIG)		
ACTUAL	INDICATED	READING
25		
30		

Figure 4-4. Converter Performance Test Sheet (Sheet 2 of 2)

4-22. FILL AND BUILDUP TIME TEST. The time required to fill the converter (10 liters) shall not exceed 10 minutes at a filling pressure of 30 psig.

4-23. The time required for the filled converter to build up a working pressure of 55 to 90 psig shall not exceed 5 minutes from time the servicing trailer filler valve is disconnected from converter. Locate indicated psig for the actual psig pressure on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

4-24. FLOW TEST. The converter shall be capable of delivering gaseous oxygen at the rate of 120 lpm while maintaining pressure of 55 to 90 psig. Make the following entries on the Performance Test Sheet:

1. Locate the indicated inH_2O for the actual flow of 120 lpm on correction card number 4. Enter indicated inH_2O in space provided on Performance Test Sheet.

2. Locate the indicated psig for actual pressures of 55 and 90 psig on correction card number 2. Enter actual psig in spaces provided on Performance Test Sheet.

4-25. CONVERTER CHARGE. Upon completing the Bench Test, the converter shall be emptied of LOX and pressurized with gaseous oxygen 25 to 30 psig. This prevents moisture from entering the converter during shipment/storage. Locate indicated psig for the actual pressures of 25 and 30 psig on correction card number 2. Enter indicated psig in spaces provided on Performance Test Sheet.

Section 4-4. Maintenance

4-26. GENERAL.

4-27. This section contains the procedural steps for inspecting, testing, troubleshooting, disassembly, cleaning, repair, assembly, and adjusting of the Liquid Oxygen Converter Assembly Type GCU-24/A (P/N 10C-0016-10A).

NOTE

Upon completion of any maintenance action (e.g., inspection, repair, modification, etc), be sure to complete the required Maintenance Data Collection System forms.

4-28. EMERGENCY PRESSURE RELIEF PROCEDURES.

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Fixture, TestValve, Gage/Relief, Pressure	Fabricate IAW figure 4-6
1	Line, Drain, Port, Vent	Fabricate IAW figure 4-7

WARNING

LOX in a non-vented container will build to 12,000 psig. Converters, however, will explode at approximately 1,200 psig. When filling the converter, or at any time, if any of the following situations are encountered, heavy frosting, icing, or excessive pressure buildup (in excess of 130 psig), perform the following steps immediately.

Do not attempt to relieve pressure in LOX converters that indicate critical over pressurization (figure 4-5). For these converters, comply with procedures as prescribed in the individual station/ships emergency procedures bill.

1. After filling is completed, attach pressure gage/relief valve test fixture (figure 4-6) to supply quick disconnect coupling (16).

2. Attach vent port drain line (figure 4-7) to converter vent port coupling (37). Ensure vent port drain line faces away from operator.

3. Ensure adapter knurl knob is backed out counterclockwise.

WARNING

When performing step 4, if excessive pressure does not relieve through vent port drain line, immediately comply with procedures as prescribed in the individual station/ships emergency procedures bill.

4. Install adapter to the fill port of fill, buildup, and vent valve (43) and relieve pressure from the converter by turning the knurl knob of the adapter clockwise four full turns (this places the converter in the vented mode).

5. Observe the pressure gage/relief valve test fixture until 70 psig is indicated.

6. Remove pressure gage/relief valve test fixture and adapter.

WARNING

When performing step 7, if LOX fails to drain from the converter disconnect LOX converter drain line, attach adapter to fill, buildup, vent valve (43) and turn knurl knob clockwise 4 full turns. (Organization level transport defective converter to AIMD immediately.)

7. Immediately place converter in a LOX drain pan, attach LOX converter drain line (figure 4-8) to supply quick-disconnect coupling (16) and drain LOX from the converter.

8. Organizational level forward the defective LOX converter to AIMD for bench test.

4-29. INSPECTION.

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical over-pressurization, immediately comply with the emergency pressure relief procedures given in paragraph 4-28 at the beginning of this section.

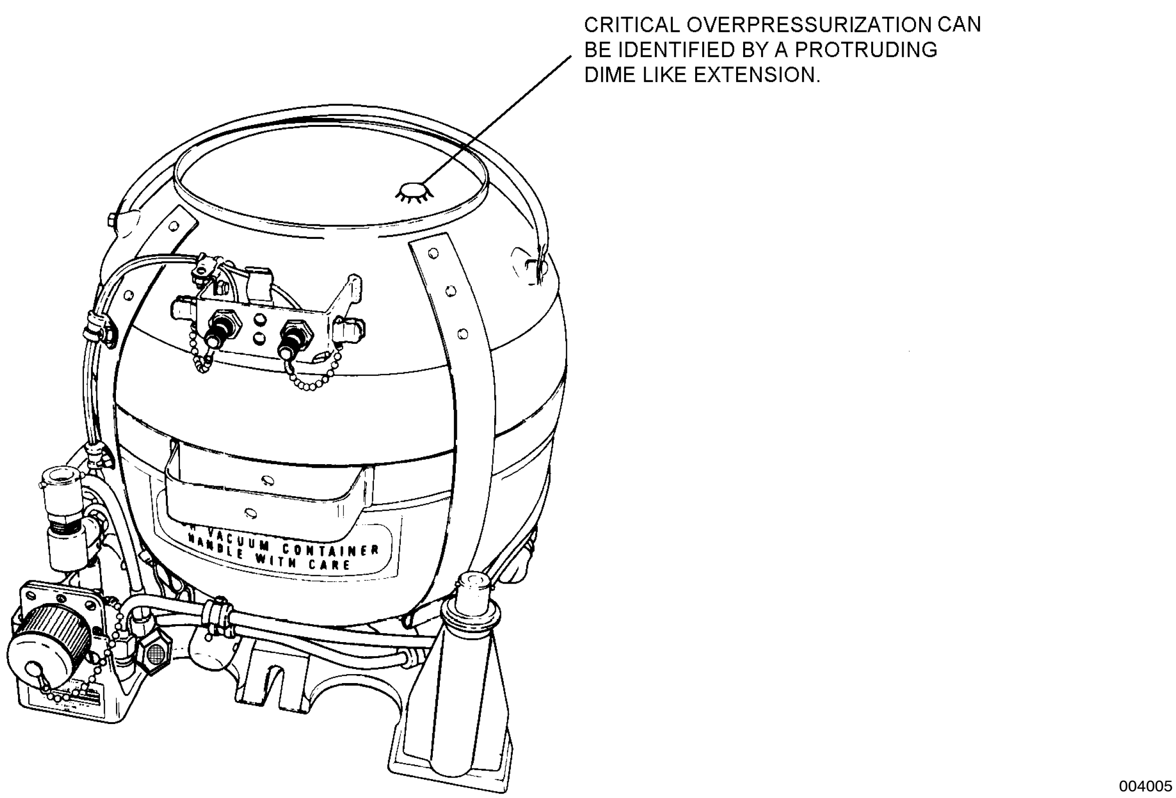
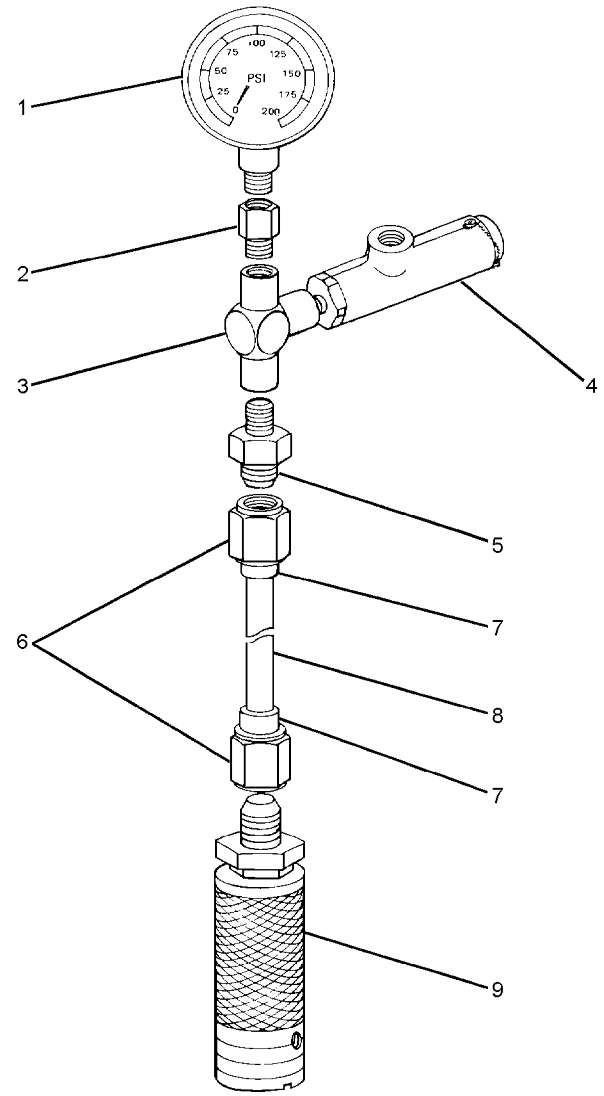


Figure 4-5. Critically Overpressurized Essex LOX Converter, P/N 10C-0016-10A



ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY
1	200 PSI Oxygen Gage	P/N 100204-18 (CAGE 42527) NIIN 00-961-1990	Anti-seize tape required (Note 1)
2	1/4 to 1/8 in. Reducer, Pipe	P/N 3200X4X2 (CAGE 79470)	Anti-seize tape required
3	Pipe Tee	AN917-1	—
4	Relief Valve	P/N 20C-0005-20 (CAGE 19062) MIL-V-9050D P/N 20C-0050-2	Adjust to relieve at 135 ± 5 psig and flow a minimum of 100 lpm (Note1). Anti-seize tape required
5	Male Connector	AN816-5D	Anti-seize tape required
6	Tubenut	AN818-5	2 required
7	Tube Sleeve	MS20819-5	2 required
8	Flared Aluminum 6061-T6 Tube (5/16″ O.D. Dia)	—	Cut length 2 1/2 to 3 1/2 in.
9	Supply Quick-disconnect Coupling	MS22608-7 P/N 199000-1 (CAGE 83533)	—

Notes: 1. The Pressure Gage/Relief Valve Test Fixture shall be forwarded to AIMD for relief valve setting, flow test, and leakage test (same as converter relief valve test only higher setting). The 200 PSIG Oxygen Gage shall be calibrated in accordance with the metrology and calibration (METCAL) program.

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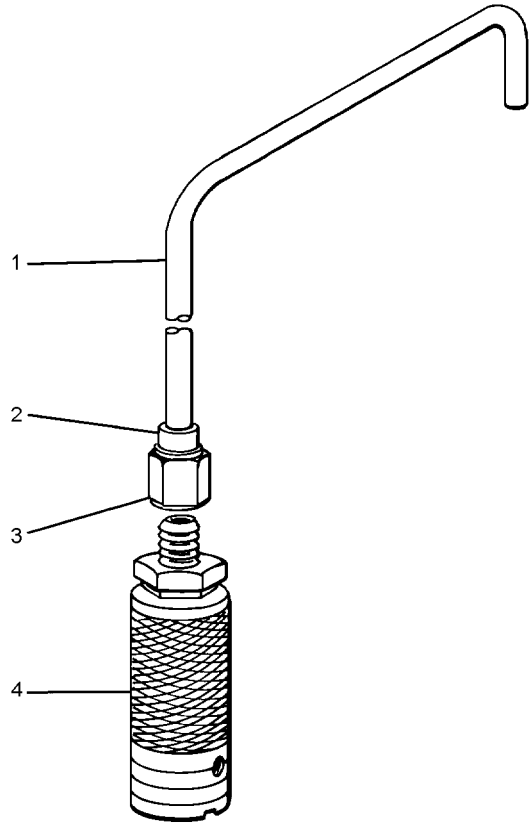
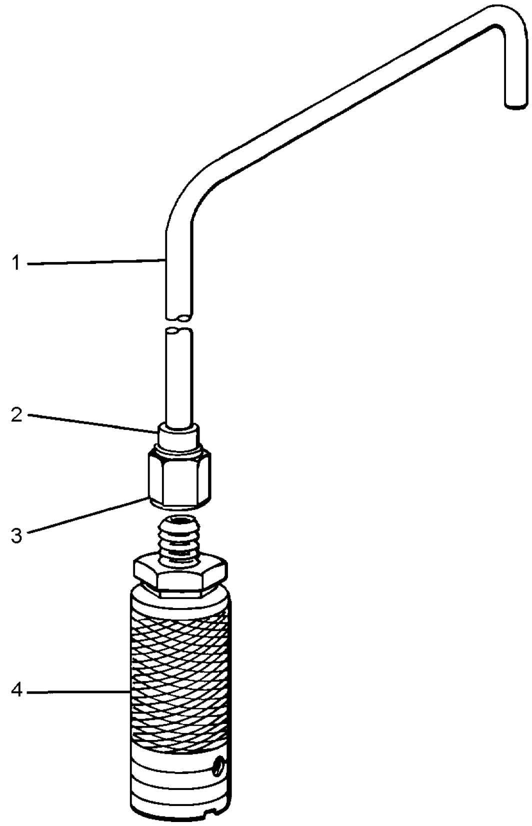
Figure 4-6. Pressure Gage/Relief Valve Test Fixture



ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY
1	Flared Aluminum 6061-T6 Tube (1/2 O.D. Dia)	—	Cut to 14-inches; bend as shown above
2	Tube Sleeve Coupling	MS20819-8	—
3	Tubenut	AN818-8	—
4	Half Coupling Quick-disconnect	2560000-1 (CAGE 83533)	—

004007

Figure 4-7. Vent Port Drain Line



ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY
1	Flared Aluminum 6061-T6 Tube (5/16″ O.D. Dia)	—	Cut to 14-inch length; bend as desired
2	Tube Sleeve	MS20819-8	—
3	Tubenut	AN818-5	—
4	Quick-disconnect Coupling	MS22068-7 P/N 199000-1 (CAGE 83533)	—

004008

Figure 4-8. LOX Converter Drain Line

4-30. ACCEPTANCE/TURNAROUND/DAILY/PRE-FLIGHT/POSTFLIGHT AND TRANSFER INSPECTIONS. The Acceptance/Turnaround/Daily/Pre-flight/Postflight and Transfer Inspections consist of a Visual Inspection followed by a Functional Test. These inspections and tests shall be performed in conjunction with the aircraft inspection requirements for the aircraft in which the converter is installed. Refer to table 4-2 for troubleshooting assistance.

NOTE

Fill the converter in accordance with paragraph 4-48; ensuring strict compliance with all steps, especially steps 5 and 6.

4-31. Any liquid oxygen converter which does not pass the Visual Inspection or Functional Test shall be removed from the aircraft, drained immediately, and replaced by a Ready For Issue (RFI) liquid oxygen converter. To drain the liquid oxygen converter, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Line, Drain, Converter, LOX	Fabricate IAW figure 4-8

NOTE

If no LOX converter drain line is available, fabricate one in accordance with figure 4-8.

1. Place converter in LOX converter drain pan in an area free from dirt and hydrocarbons.

WARNING

Ensure that draining LOX is directed away from all personnel.

2. Attach drain line (figure 4-8) to converter supply quick-disconnecting, which will immediately begin draining converter.

3. Contact Maintenance Control for action to be taken.

4-32. Visual Inspection. Visually inspect the converter assembly and surrounding area for the following:

WARNING

When working with oxygen, make certain that clothing, tubing fittings, and equipment are free of oil, grease, fuel, hydraulic fluid, or any combustible liquid. Fire or explosion may result when even slight traces of combustible material come in contact with oxygen under pressure.

1. Freedom from dirt and hydrocarbons.

2. Correct installation and positioning of all components.

3. Presence and condition of safety wire and Glyptal dots on relief valve and pressure closing valve.

4. Legibility of all markings.

5. Cracks, dents, or other damage to tubing, valves, and electrical connections.

6. Corrosion on converter assembly and surrounding areas.

7. Obstructions in aircraft overboard vent line.

8. Security of supply, vent and electrical quick-disconnects.

9. Excessive frosting and/or continuous venting of converter assembly.

10. Ensure that date on converter bench test decal is current (within last 231 days).

4-33. Functional Test. To functionally test the converter assembly and aircraft oxygen system, proceed as follows:

NOTE

The Functional Test should also be performed whenever a component of the aircraft oxygen system is removed/replaced.

1. Ensure that all circuit breakers associated with the LOX quantity indicating system are set.

NOTE

External electrical power must be applied to the aircraft to perform steps 2 and 3.

Refer to applicable aircraft Handbook of Maintenance Instructions (HMI) to determine at what quantity (indicated on quantity gage) that low warning light should illuminate.

2. Depress oxygen test switch. Check quantity gage and low warning light for proper operation.

3. Release test switch. Ensure that gage pointer returns to position registered on gage before depressing. When test is completed, disconnect electrical power from aircraft.

4. Ensure that oxygen shut-off valve is in OFF position.

5. Attach an oxygen mask, regulator, and regulator-to-seat kit hose assembly to oxygen supply connection in aircraft.

6. Turn oxygen shut-off valve to ON position. There should be a flow of oxygen through the mask.

NOTE

Resistance during exhalation is due to the positive pressure feature of the regulator.

7. Place mask against face and breathe. There should be a slight resistance during exhalation.

8. Upon completion of functional test, turn oxygen shutoff valve to OFF. Disconnect regulator-to-seat kit hose from aircraft supply connection.

4-34. If discrepancies are found or suspected, Maintenance Control shall be notified.

4-35. Components of the aircraft oxygen system which do not pass inspection and cannot be repaired in the aircraft shall be removed and replaced by Ready For Issue (RFI) components. Forward defective components to AIMD for Bench Test.

4-36. CALENDAR INSPECTION. The Calendar Inspection shall be performed on all liquid oxygen converters that incorporate a quick disconnect mounting plate prior to placing in service, and at intervals not exceeding 231 days thereafter. This interval applies to all converters; aircraft-installed, shop spares, and those maintained in a servicing pool.

4-37. The Calendar Inspection consists of a Visual Inspection followed by a Bench Test. All work shall be performed in a clean, dust-free and oil-free area. Converter assemblies found to be damaged or out of adjustment shall be repaired by replacing or adjusting the discrepant part or parts. After repair, repeat the Bench Test.

NOTE

Liquid oxygen converters new from supply, manufacture, or from NARF overhaul do not require the bench test decal. The bench test decal shall be placed on the converter by the local AIMD when the converter is placed in service and after each Bench Test.

4-38. Visual Inspection. Inspect the converter assembly in accordance with table 4-3.

4-39. Liquid oxygen converters failing the Visual Inspection or Bench Test (paragraph 4-44) shall be repaired, if specific repair is authorized. SM&R codes, define repairable components and levels of maintenance authorized to perform repairs. Further explanation is found in Naval Aviation Maintenance Program Manual, OPNAVINST 4790.2 Series.

4-40. BENCH TEST.

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical over-pressurization, immediately comply with the emergency pressure relief procedures given in paragraph 4-28 at the beginning of this section.

Table 4-2. Troubleshooting (Acceptance/Turnaround/Daily/Preflight/Postflight and Transfer Inspections)

Trouble	Probable Cause	Remedy
Converter will not fill.	Ice in filler valve or filler obstructs LOX flow.	Thaw filler valve or filler line.
Converter does not fill in required time.	Filler line not properly purged prior to filling.	Purge and cool filler line.
	Converter not sub-cooled before filling.	Lower pressure in servicing trailer and sub-cool converter.
	Filling pressure too low.	Set fill pressure in accordance with servicing trailer operating instructions.
	Defective converter.	Replace converter with RFI converter.
Frost collects on entire outer jacket of converter.	Heat loss due to annular space leakage.	Replace converter with RFI converter.
Converter will fill only partially (gas only emitted from vent).	Converter not sub-cooled prior to filling.	Lower pressure in servicing trailer and sub-cool converter.
System will not build up.	Buildup, vent and filler valve defective or partially open.	Replace converter, or thaw valve.
	Pressure relief valve open.	Replace converter with RFI converter.
Oxygen supply consumed too quickly.	Converter not completely filled during filling operation.	Refill converter.
	System leakage.	Locate and repair leaks.
	Buildup, vent and filler valve partially open, venting gas.	Replace converter with RFI converter.
Filler line cannot be disconnected from filler valve.	Filler nozzle frozen to filler valve.	Thaw nozzle.
Low, or no system pressure.	System leakage.	Locate and repair leaks.
	Pressure closing valve out of adjustment.	Replace converter with RFI converter.
Quantity gage indicates empty.	System empty; defective probes or gage.	Refill converter; replace converter or gage.
LOX system contaminated.	Undesirable odors, or moisture.	Purge system.

Table 4-3. Visual Inspection of Type GCU-24/A Liquid Oxygen Converter, P/N 10C-0016-10A

Part Nomenclature	Index Number	Inspect For	Remedy
Note: Index numbers in this table refer to figure 4-15.			
Identification and performance plates.	-1 and -3	Legibility, condition and security.	Secure in place or replace.
Warning and bench test decals.	-5 and -6	Presence and condition.	Replace or apply as required.
Handle.	-7	Bends and cracks.	Replace.
Tubing assemblies.	-12, -23, -29, -32, -35, and -73	Cracks, dents, nicks, scratches, twists and proper clearance. Damaged connectors and tube nuts.	Replace damaged tubing assemblies and connectors. Tubing may be slightly bent to maintain a minimum 1/16-inch clearance between other converter components.
Elbows and nipples.	All	Cracks, dents and scratches.	Replace.
Male quick-disconnects.	-16 and -37	Visible damage.	Replace.
Supply manifold assembly.	-17	Visible damage.	Replace.
Fill buildup and vent valve.	-43	Cracks, damaged poppet valve, nosepiece or worn helical grooves.	Replace.
Clamps.	All	Security and condition.	Tighten or replace.
Pressure relief and pressure closing valve.	-49 and -50	Cracks or other visible damage. Presence and condition of Glyptal dots. Presence and condition of safety-wire.	Perform bench test.
Mounting strap, mounting cradle and mounting base assembly.	-37, -67, and -78	Cracks, broken welds, chipped paint or other visible damage.	Replace. Restore finish by painting (paragraph 4-61).
Sphere assembly.	-77	Evidence of over pressurization (dime like protrusion) excessive dents, chipped paint or other damage.	Refer to paragraph 4-61 for size of acceptable dents. Restore finish by painting (paragraph 4-61).
Converter assembly.	No Index	Freedom from dirt, hydrocarbons and corrosion.	Clean (paragraph 4-57) and/or refinish (paragraph 4-61).
Burst disc.	-31	Cracks, dents, ruptures, or other damage.	Replace (paragraph 4-71).

NOTE

Some in-service liquid oxygen converter test stands that bear part numbers other than those mentioned in paragraph 4-41 or covered in appropriate ground support equipment manual still exist. Use of these test stands is authorized provided they are capable of monitoring converter performance as specified in the Bench Test.

4-41. The Bench Test shall be performed using Liquid Oxygen Converter Test Stand P/Ns 59A120, 31TB1995-1, 1455AS100-1 or 31TB1995-4. Refer to appropriate ground support equipment manual for identification of test stand controls and indicators referenced in Bench Test procedures. Do not attempt to perform any Bench Test without first becoming thoroughly familiar with the test stand (refer to appropriate ground support equipment manual). Utilize Performance Test Sheet (figure 4-4) when performing Bench Test.

WARNING

When working with oxygen, make certain that clothing, tubing fittings, and equipment are free of oil, grease, fuel, hydraulic fluid, or any combustible material. Fire or explosion may result when even slight traces of combustible material come in contact with oxygen under pressure.

Prior to use, inspect leak detection compound. Compound which is not clear and free from suspended material/sediment is considered contaminated and shall be disposed of. Compound exhibiting peculiar odors such as acetone or alcohol is considered contaminated and shall be disposed of.

When using leak detection compound, carefully avoid getting it on probe wire connections as moisture will cause incorrect capacitance/insulation reading.

NOTE

Tests are arranged so they proceed from one test to the next with a minimum of flow changes. Troubleshooting tables are provided following each test.

4-42. TARE WEIGHT. To find the Tare Weight of the complete converter assembly, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

NOTE

Tare weight is the weight of the complete converter assembly less the weight of the LOX.

1. Ensure all LOX has been removed from the converter.

2. Place converter assembly on scale of at least 50-lb capacity. Record weight in space provided on Performance Test Sheet.

4-43. CONVERTER ASSEMBLY PURGE. To purge the converter assembly, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Nitrogen, Oil-free, Water Pumped, Type I, Class I, Grade B	Fed Spec BB-N-411 NIIN 00-985-7275

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Coupling, Quick-disconnect, Half	256000-1 MS22068-8 (CAGE 83533)
1	Expander, Thread, Screw, Bushing	AN894-8-4
1	Line, Drain, Converter, LOX	Fabricate IAW figure 4-8
1	Purging Unit, Gas/LOX, Model A/M26M-3	3447AS100-1

WARNING

Use only oil-free nitrogen, Type I, Class I, Grade B for purging LOX converters.

Purging unit model A/M26M-3 has two specially designed 3500 psig nitrogen cylinders. Do not substitute these cylinders with other nitrogen cylinders such as NAN cart cylinders.

While operating purging unit A/M26M-3, protective gloves must be worn by operator. Discharge fittings and hoses can reach temperatures that will cause burns if grasped with bare hands.

NOTE

Personnel operating purging unit model A/M26M-3 should be thoroughly familiar with all valves and controls prior to operating. Refer to appropriate support equipment manual. Personnel operating purging unit model A/M26M-3 shall be licensed in accordance with OPNAVINST 4790.2 series.

Liquid oxygen converters shall be emptied of all LOX and allowed to warm to ambient temperature prior to purging.

Index numbers in parentheses for LOX converter assembly refer to figure 4-15.

Index numbers for purging unit model A/M26M-3 refer to figure 4-9.

1. Remove two supply lines (14) from purge unit cabinet. Connect one end of each supply line (14) to nitrogen supply cylinders and the other ends to the supply inlet connections (22) of purge unit.

2. Remove insulated hose (15) from purge unit cabinet. Connect quick disconnect (18) of insulated hose (15) to system (A) quick disconnect (19) of purge unit.

3. Screw boss to pipe fitting (AN894-8-4) onto quick disconnect coupling and attach to B-nut (23) of insulated hose (15).

4. Turn purge unit 3-way valve (20) to system (A) position.

5. Ensure power switch (5) is OFF.

6. Remove power cable (17) from purge unit cabinet and plug into 110 volt outlet.

7. Open both nitrogen supply cylinder valves.

8. Open hand shutoff valves (1) and (3). High pressure gage (4) will indicate nitrogen supply cylinder pressure.

9. Connect quick disconnect coupling (P/N 256000-1), attached to insulated hose (15), to LOX converter vent port of fill, build up, and vent valve (43).

10. Attach adapter to fill port of LOX converter fill, build up, and vent valve (43). Turn knurl knob of adapter clockwise until it seats, then back off counterclockwise two (2) full turns. This will place the fill, build up, and vent valve half way between the fill/vent and build up/vent modes.

11. Attach LOX converter drain lines (figure 4-8) to LOX converter supply quick disconnect coupling (16).

12. Turn power switch (5) to ON position. Power on light (6) should illuminate.

13. Turn pressure regulator (11) clockwise until 120 psig is indicated on low pressure gage (2).

NOTE

For LOX converters that show indications of internal probe short, it may be necessary to purge the converter for a longer period of time when performing step 14.

14. Observe heater on light (7). When light cycles from on to off, purge the converter for 30 minutes, with a minimum discharge temperature of 90°F.

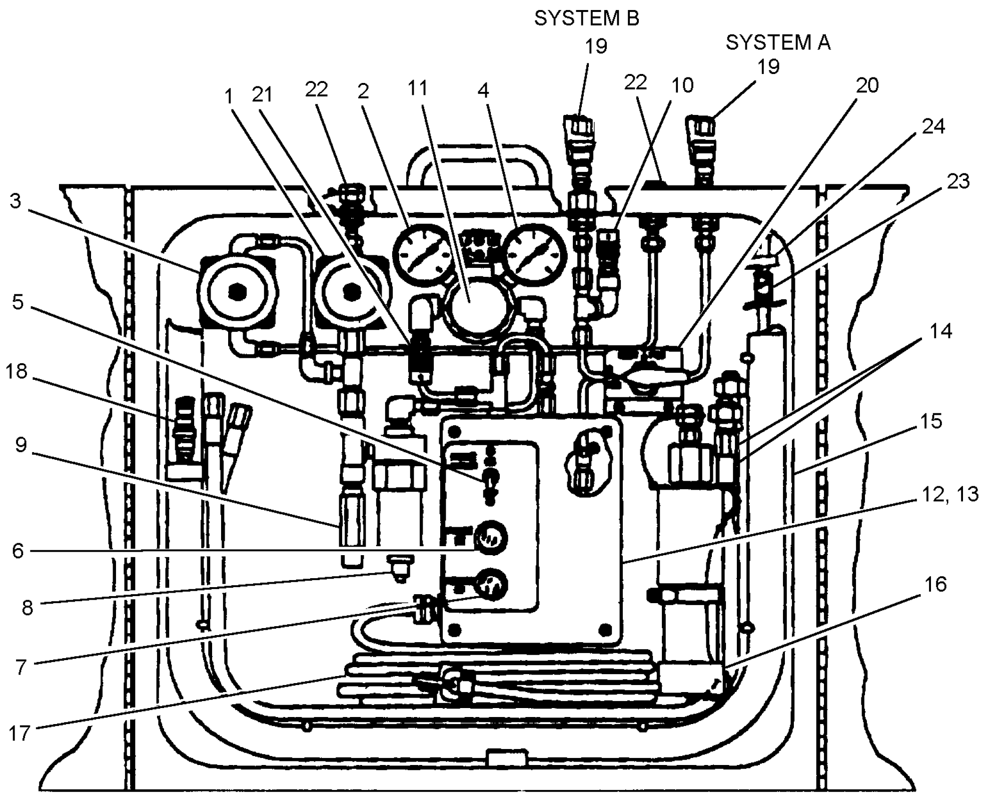
15. When purging is completed, turn purging unit power switch (5) to off.

16. Close nitrogen supply cylinder valves.

17. Observe low pressure gage (2) and high pressure gage (4) until they indicate 0 psig. Back out counterclockwise on pressure regulator (11).

18. Close hand shutoff valves (1) and (3).

19. Disconnect insulated hose (15) from LOX converter vent port fitting of fill, build up, and vent valve (43) and purging unit system (A) quick disconnect (19).



Description	Function
1. Hand Shutoff Valve	Controls Supply Gas Flow
2. Low Pressure Gage	Indicates Delivery Gas Pressure (0-200 PSIG)
3. Hand Shutoff Valve	Controls Supply Gas Flow
4. High Pressure Gage	Indicates Supply Gas Pressure (0-4000 PSIG)
5. Power Switch	Master On/Off Switch/Circuit Breaker
6. Power On Light	Indicates Master Switch is On and Set is Operational
7. Heater On Light	Indicates Operation of Heater
8. Priority Valve	Stops Gas Flow When Supply Gas Pressure Falls Below 200 PSIG
9. Relief Valve	Relieves Supply Pressure Exceeding 3750 PSIG
10. Low Pressure Relief Valve	Relieves Service Line Supply Pressure Exceeding 705 PSIG
11. Pressure Regulator Assembly	Regulates Pressure to 0-200 PSIG
12. Temperature Control Switch (Under Plate)	Cycles Off and On to Control Exit Gas
13. High Temperature Shutdown (Under Plate)	Shuts Off Heater when Heater Block Temperature Reaches 285°F
14. Supply Line	Connects Supply Cylinders to Housing Assembly
15. Insulated Hose Assembly	Connects Housing Assembly
16. Filler Valve	Connects Insulated Hose Assembly to Converter
17. Power Cable	Connects Unit to Electrical Power
18. Quick Disconnect	Connects Insulated Hose to 19 System A or B
19. Quick Disconnect	Connection for Insulated Hose to 19 System A or B
20. 3-Way Valve	Selects A or B Outlet Ports
21. High Pressure Relief Valve	Relieves Service Line Supply Pressure Exceeding 1355 PSIG
22. Supply Pressure Inlet	Connects Supply Line 14 to Purge Unit
23. B-Nut	Connects Insulated Hose to Filler Valve 16 or Adapter (Not Shown)
24. Adapter	Connects Insulated Hose to P-3 Aircraft Filler Port

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Figure 4-9. A/M26M-3 Purging Unit

20. Remove drain lines (figure 4-8) from LOX converter supply quick disconnect coupling (16).

21. Remove adapter from filler port of fill, build up, and vent valve (43).

22. Stow all lines and accessories and secure from purging.

4-44. INSULATION RESISTANCE TEST (EMPTY). To perform the Insulation Resistance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Prior to proceeding, it should be noted that the minimum acceptable megohm readings have been changed as follows. Between A to B, 2.0 megohms; between A to ground and B to ground the reading shall not be less than 1.0 megohm. These readings are acceptable as long as the converter passes the Capacitance Test (Empty) and Capacitance Test (Full).

1. Secure empty converter in rack provided on test stand counter top.

2. Using test stand cable assembly (figure 4-10), connect upper terminals of high and low capacitance cable assemblies (65 and 66, figure 4-15) to terminals A and B of liquid oxygen quantity gage capacitance type tester.

3. Turn power switch ON and allow tester to warm up 10 minutes prior to proceeding.

4. Turn MEGOHMMETER RANGE SELECTOR to X-1 position.

5. Turn FUNCTION SELECTOR knob from A to B position. Record reading in space provided on Performance Test Sheet. Reading should not be less than 2.0 megohms.

6. Turn FUNCTION SELECTOR knob from A TO GROUND and B TO GROUND positions, respectively. Record readings in spaces provided on Performance Test Sheet. Readings shall not be less than 1.0 megohm in either position.

NOTE

If insulation resistance readings are acceptable proceed to step 11.

7. If insulation resistance readings are less than allowed, connect cable (figure 4-11) to lower probe terminals, and repeat steps 5 and 6.

8. If readings are acceptable, replace low or high capacitance cable assemblies (65 and 66, figure 4-15) as required. Repeat steps 5 and 6. If readings are acceptable, proceed to step 11.

9. If readings continue to be less than acceptable, moisture may still be present in sphere assembly. Purge converter in accordance with paragraph 4-43 and repeat test.

10. Converter assemblies that fail the Insulation Resistance Test and cannot be corrected by replacing low/high capacitance cable assemblies or by purging, shall be forwarded to the next higher maintenance repair facility.

11. Leave all connections unchanged.

4-45. CAPACITANCE TEST (EMPTY). To perform the Capacitance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Turn CAPACITANCE RANGE SELECTOR knob to X-10 position.

2. Turn FUNCTION SELECTOR knob to CAPACITANCE (UUF) position.

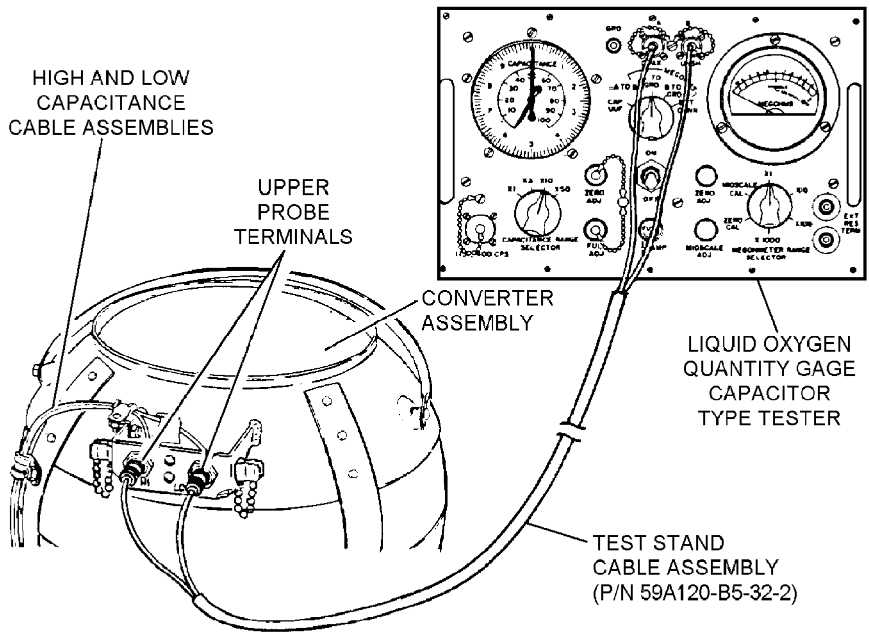


Figure 4-10. Capacitance/Insulation Resistance Test Hook-up Upper Probe Terminals

3. Record reading in space provided on Performance Test Sheet. Reading shall be 121.5 to 125.5 micromicrofarads (μμF). If reading is acceptable, proceed to step 7.

4. If reading is not within limits, connect test stand cable assembly (figure 4-11) to lower probe terminals of high and low capacitance cable assemblies, and repeat steps 1 through 3.

5. If reading is acceptable in step 4, capacitance cables are defective. Replace high and low capacitance cable assemblies (65 and 66, figure 4-15). Connect test stand cable assembly to upper probe terminals and repeat steps 1 through 3.

6. If reading is still not within limits in step 4, moisture may still be present in sphere. Purge converter in accordance with paragraph 4-43, and repeat Capacitance Test.

NOTE

Converters that fail the Capacitance Test and cannot be corrected by replacing capacitance cables or purging shall be forwarded to the next higher maintenance repair facility.

7. Secure power to tester and disconnect test stand cable assembly from converter and test stand.

4-46. RELIEF VALVE TEST. To perform the Relief Valve Test, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Glyptal	1201B (CAGE 24452)

Support Equipment Required

Quantity	Description	Reference Number
1	Hose Assembly, Stand, Test	59A120-B5-14
1	Hose Assembly, Stand, Test	59A120-B5-52
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Index numbers in parentheses refer to figure 4-15.

1. Disconnect low and high capacitance cable assemblies (65 and 66) from lower probe terminals.

2. Hold 45° elbows (36) with open end wrench to prevent turning while loosening tube nut connections. Disconnect buildup tube assembly (35) from buildup port of fill, buildup, and vent valve (43) and from pressure closing valve (50).

3. Cap 45° elbow (36) in buildup port of fill, buildup, and vent valve (43).

4. Using test stand hose assembly (P/N 59A120-B5-14), connect test stand BELL JAR BOTTOM COUPLING (C-1) to the 45° elbow (36) on converter pressure closing valve (50).

5. Using test stand hose assembly (P/N 59A120-B5-52), connect converter quick disconnect coupling (37) to test stand FLOWMETER connection (NIP-4).

6. Turn FLOWMETER SELECTOR valve (V-1) to the 0-150 lpm position. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly and observe TEST PRESSURE gage (PG-1) and flowmeter PG-2 when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

7. Slowly open OXYGEN SUPPLY valve (V-6) until 100 lpm flow is indicated on FLOWMETER INDICATOR gage (PG-2).

8. With 100 lpm indicated on FLOWMETER INDICATOR gage (PG-2), reading on test pressure (PG-1) shall be 100-120 psig. Record reading from TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2) on Performance Test Sheet.

9. Using OXYGEN SUPPLY valve (V-6) and SYSTEM BLEED valve (V-5), reduce pressure applied to converter to 95 psig as indicated on TEST PRESSURE gage (PG-1).

10. Disconnect test stand hose (P/N 59A120-B5-52) from FLOWMETER connection (NIP-4).

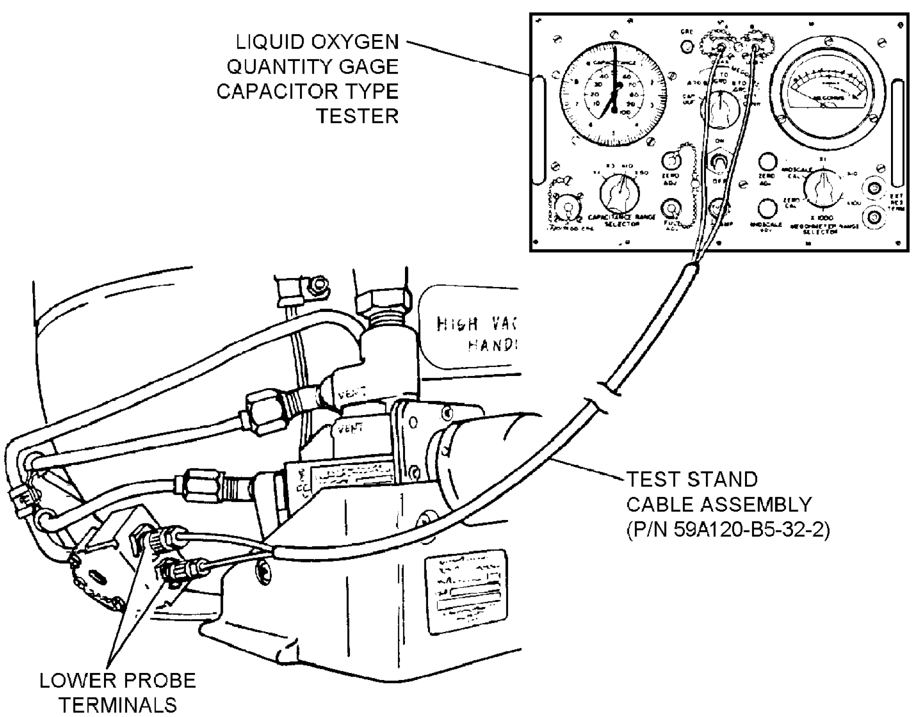


Figure 4-11. Capacitance/Insulation Resistance Test Hook-up Lower Probe Terminals

CAUTION

When attaching test stand hose (P/N 59A120-B5-52) to FLOWMETER connection (NIP-1) attach slowly while observing FLOWMETER INDICATOR gage (PG-2) excessive relief valve leakage could damage FLOWMETER INDICATOR gage (PG-2).

11. Turn FLOWMETER SELECTOR valve (V-1) to the 0.0-0.25 lpm position and slowly connect test stand hose (P/N 59A120-B5-52) to FLOWMETER connection (NIP-1).

12. While maintaining 95 psig to the converter with OXYGEN SUPPLY valve (V-6), check for leakage indicated on FLOWMETER INDICATOR gage (PG-2). Maximum allowable leakage is 0.01 lpm. Record reading on Performance Test Sheet.

13. If leakage is excessive, or if relief valve fails to vent at required flow and pressure, locate probable cause using troubleshooting chart (table 4-4).

14. Apply Glyptal dots to safety wired setscrews.

15. Close OXYGEN SUPPLY valve (V-6). Bleed test stand using SYSTEM BLEED valve (V-5). Close TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

16. Disconnect test stand hose assemblies (P/Ns 59A120-B5-14 and 59A120-B5-52) from converter and from test stand.

17. Uncap 45° elbow capped in step 3, and reconnect buildup tube (34) removed in step 2.

18. Reconnect high and low capacitance cable assemblies (65 and 66) removed in step 1.

4-47. CONVERTER LEAKAGE TEST. To perform the Converter Leakage Test, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Hose Assembly, Stand, Test	59A120-B5-14
1	Coupling, Quick-disconnect (Female)	199000-1 MS22068-7
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Index numbers in parentheses refer to figure 4-15.

1. Connect quick-disconnect coupling to test stand hose assembly.

2. Using hose assembly, connect test stand BELL JAR BOTTOM COUPLING (C-1) to converter quick disconnect coupling (16).

3. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

4. Utilizing OXYGEN SUPPLY valve (V-6) apply 95 psig as indicated on TEST PRESSURE gage (PG-1) to converter.

5. Maintain 95 psig and inspect for leakage at all connections using leak detection compound. There is no allowable leakage. If leakage is indicated, locate probable cause using troubleshooting chart, table 4-5.

Table 4-4. Troubleshooting (Relief Valve Test)

Trouble	Probable Cause	Remedy
Relieving below 100 psig.	Relief valve out of adjustment.	Adjust in accordance with paragraphs 4-65, 66, and 67.
Relieving above 120 psig.	Relief valve out of adjustment.	Adjust in accordance with paragraphs 4-65, 66, and 67.
Relief valve fails to vent 100 lpm.	Relief valve out of adjustment.	Adjust in accordance with paragraphs 4-65, 66, and 67.
Leakage in excess of 0.01 lpm.	Relief valve out of adjustment.	Adjust in accordance with paragraphs 4-65, 66, and 67.
Relief valve cannot be adjusted to tolerances.	Defective parts.	Replace relief valve.

Table 4-5. Troubleshooting (Converter Leakage Test)

Trouble	Probable Cause	Remedy
Any fitting connection leaking.	Loose connection.	Tighten connection.
Elbow or nipple fitting leaking.	Stripped threads, excessive burrs, deep scratches, inside or outside diameter out of round or loose.	Tighten or replace fitting(s).
Tubing leaking.	Dents, kinks, deep scratches, twisted tubing, improperly flared ends or damaged connectors.	Replace tubing.

6. Close OXYGEN SUPPLY valve (V-6). Disconnect hose assembly installed in step 2 from converter quick disconnect coupling (16) and apply leak detection compound to converter supply quick disconnect coupling (16).

7. Bleed test stand using SYSTEM BLEED valve (V5). Close TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

8. Using adapter, bleed pressure from the converter.

9. Remove converter assembly from test stand.

4-48. FILL AND BUILDUP TIME TEST. To perform the Fill and Buildup Time Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Line, Drain, Port, Vent	Fabricate IAW figure 4-7

WARNING

Because of the extreme low temperature of LOX, use extreme care at all times when handling LOX. Ensure prescribed protective clothing is worn, and all safety precautions are observed (Chapter 3).

Ensure venting LOX is directed away from all personnel in the area.

NOTE

Personnel servicing LOX converters and operating LOX transfer equipment shall be qualified and licensed in accordance with OPNAVINST 4790.2 Series.

To perform this test it will be necessary to take the converter to a LOX servicing area, or use a LOX servicing trailer in the immediate area of the Oxygen Shop. Any other method is acceptable that meets requirements of the test, and does not violate safety precautions outlined in Chapter 3.

1. Connect the converter to the servicing trailer.

NOTE

If servicing trailer being used is not the closed loop type, attach a vent port drain line (figure 4-7) to the vent port coupling (37). Ensure vent port drain line is attached to route venting LOX away from all personnel.

2. Note the time, and fill the converter, following applicable instructions for specific ground support equipment servicing trailer being used.

3. When the converter is full, note the time. Time required to fill the converter shall not exceed 10 minutes. Record fill time in space provided on Performance Test Sheet.

4. Note the time and disconnect and secure the servicing trailer (remove the vent port drain line if installed). Time noted is beginning of Fill and Buildup Time Test.

NOTE

The test pressure gage relief valve test fixture shall be forwarded to the Intermediate Maintenance activity every 6 months for pressure gage calibration and relief valve adjustment and leakage test.

5. Immediately after servicing, attach pressure gage/relief valve test fixture (figure 4-6) to converter supply quick-disconnect coupling (16) and observe for 5 minutes; the following actions should occur:

a. The converter should begin to build head pressure as indicated on the pressure gage/relief valve test fixture. Initially the converter will build a pressure that will cause the LOX converter relief valve to relieve (110 to 120 psig). This action may occur twice.

WARNING

When performing step 5b., if pressure fails to stabilize, drain the LOX converter and forward to Intermediate Level maintenance.

b. After step 5a occurs, pressure indication on the pressure gage/relief valve test fixture should stabilize at LOX converter pressure closing valve setting of 55 to 90 psig (a slight fluctuation of 2 to 3 psig on the pressure gage/relief valve test fixture will be present).

6. Disconnect pressure gage/relief valve test fixture from supply quick-disconnect coupling.

7. If converter fails to build head pressure, converter relief valve fails to relieve between 110 to 120 psig, or converter fails to stabilize between 55 to 90 psig, refer to troubleshooting chart (table 4-6).

8. Remove pressure gage/relief valve test fix installed in step 5.

4-49. CAPACITANCE TEST (FULL). To form the Capacitance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 21TB1995-1 or 31TB1995-4 or 1455AS100-1
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

NOTE

This test requires simultaneous use of the 50 lb capacity scale and the quantity gage capacitance type tester incorporated in the test stand. Ensure that scale is positioned close enough to tester.

1. Place full converter on a scale of at least 50-lb capacity.

2. Using test stand cable assembly (figure 4-10), connect upper terminal of converter high and low capacitance cable assemblies (65 and 66, figure 4-15) to terminals A and B of liquid capacitance type tester.

3. Turn power ON and allow tester to warm up 10 minutes before proceeding.

4. Turn CAPACITANCE RANGE SELECTOR knob to 10X position.

5. Turn FUNCTION SELECTOR knob to CAPACITANCE (UUF) position.

6. Enter total weight of full converter in space provided on Performance Test Sheet (figure 4-4).

7. Enter Tare Weight of converter in space provided on Performance Test Sheet.

NOTE

If the weight of the LOX in the converter is 24 pounds 4 ounces, 24 pounds 8 ounces, and etc.; the ounces must be converted to decimal.

Example

24 lb 4 oz = 24-4/16 lbs

24-4/16 lbs = 24.25 lbs

Enter 24.25 on the Performance Test Sheet.

8. Subtract Tare Weight of converter from total weight. Enter this figure on Performance Test Sheet. This is weight of LOX in converter.

9. Calculate the capacitance maximum (C-max) by multiplying the weight of the LOX (W) by 2.33, and adding 124.7 to the result (2.33(W) + 124.7 = C-max). Enter the result in the space provided on the Performance Test Sheet.

10. Calculate the capacitance minimum (C-min) by multiplying the weight of the LOX (W) by 2.25, and adding 122.3 to the result (2.25(W) + 122.3 = C-min). Enter the result in space provided on Performance Test Sheet.

11. Observe and record capacitance reading from test stand capacitance gage in space provided on Performance Test Sheet. Reading shall be between minimum and maximum established in steps 9 and 10.

12. If reading is not within limits, connect test stand cable assembly (figure 4-11) to lower probe terminals of high and low capacitance cable assemblies and repeat steps 3 through 11.

13. If the test is within limits replace the cable assemblies (65, 66, figure 4-15) and repeat steps 1 through 11.

14. If test is not within limits and converter has not been purged in previous tests, there must be moisture in the sphere. Purge converter in accordance with paragraph 4-43, refill with LOX, and repeat steps 1 through 11.

Table 4-6. Troubleshooting (Fill and Buildup Time Test)

Trouble	Probable Cause	Remedy
Converter fails to build head pressure.	Converter fill, buildup, and vent valve failed to return to build-up and supply mode.	Forward converter to AIMD for purge or valve replacement and Bench Test. Drain converter by removing the tube assembly (index number 29, figure 4-15). Place converter upside down in drain pan and allow to drain by gravity flow process.
Converter relief valve fails to relieve between 110 to 120 psig.	Converter relief valve out of adjust ment or defective.	Forward converter to AIMD for relief valve adjustment or replacement and Bench Test.
Converter pressure continues to build and will not stabilize.	Converter pressure closing valve defective.	Forward converter to AIMD for pressure closing valve replacement and Bench Test.

NOTE

If capacitance reading is still not within limits, the converter shall be forwarded to the next higher maintenance repair facility.

15. Secure tester and disconnect cable (figure 4-10) from converter and tester. If converter passes Capacitance Test, carefully remove converter from scale.

4-50. FLOW TEST. To perform the Flow Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Hose Assembly, Stand, Test	59A120-B5-12
1	Hose Assembly, Stand, Test	59A120-B51
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Secure converter in rack provided on test stand counter top.

2. Using test stand hose assembly (P/N 59A120-B5-12), interconnect test stand FLOWMETER connection (NIP-4) to CONVERTER SUPPLY OUTLET connection (NIP-5).

3. Using test stand hose assembly (P/N 59A120-B51), connect test stand SUPPLY-TO-CONVERTER connection (NIP-6) to converter quick-disconnect coupling (16, figure 4-15).

4. Place test stand FLOWMETER SELECTOR valve (V-1) in 0-150-lpm position. Open TEST PRESSURE GAGE BUILD-UP AND FLOW valve (V-10).

NOTE

If TEST PRESSURE gage (PG-1) reads above 90 psig, attach fill vent adapter (P/N 59A120-D5-46) to the fill, buildup, and vent valve. Vent converter system pressure to 70 psig by turning knurled knob clockwise.

5. Open test stand CONVERTER SUPPLY FLOW CONTROL valve (V-9) to a flow of 120 lpm as indicated on FLOWMETER INDICATOR gage (PG-2). Flow for a minimum of 5 minutes.

6. While maintaining a 120-lpm flow, the converter shall maintain pressure of 55 to 90 psig as indicated on TEST PRESSURE gage (PG-1). Record pressure in space provided on Performance Test Sheet.

7. If converter supply pressure is not within limits, locate probable cause using troubleshooting chart, table 4-7.

8. Disconnect test stand hose assemblies attached in steps 2 and 3. Close all test stand valves.

9. Remove converter from test stand and allow it to remain undisturbed for 1 hour.

4-51. EVAPORATION LOSS TEST (BUILDUP AND SUPPLY MODE). To perform the Evaporation Loss Test in the buildup and supply mode, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

1. Gently place converter on scale and record time and converter weight on Performance Test Sheet.

2. Place converter assembly aside and allow it to remain undisturbed for 24 hours.

3. Carefully place converter on scale and record time and weight in spaces provided on Performance Test Sheet. Weight loss in 24 hours shall not exceed 3.0 lb.

4. If weight loss is 3.0 lb or less, and there is no excessive frosting of the sphere assembly, drain LOX from converter and proceed to converter charge, paragraph 4-52. If weight loss is in excess of 3.0 lb or if there is sphere assembly frosting, consult troubleshooting chart, table 4-8, then proceed to paragraph 4-52.

4-52. EVAPORATION LOSS TEST (VENTED MODE). To perform the Evaporation Loss Test in the vented mode, proceed as follows:

Materials Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

NOTE

This test required only if converter fails Evaporation Loss Test in buildup and supply mode. By comparing the weight loss of this test to that recorded during the buildup and supply Evaporation Loss Test, it is possible to determine whether sphere assembly degradation, vacuum loss, fitting leakage, or valve malfunction was responsible for converter failure during the buildup and supply Evaporation Loss Test.

1. With converter still on scale, attach test stand fill valve adapter to fill, buildup, and vent valve on converter.

WARNING

Venting a converter that is in a buildup and supply mode causes a blast of LOX from vent port (figure 4-15, item 36). Ensure that vent blast is directed away from all personnel, and that adequate clothing and facial protection are worn.

2. Turn knurled knob of adapter clockwise until it seats. This will place the converter in the vented mode.

3. After converter stabilizes, record time and weight in space provided on Performance Test Sheet.

4. Place converter aside and allow it to remain undisturbed in the vented mode for 24 hours.

5. At the end of the 24-hour period, carefully place converter on scale.

Table 4-7. Troubleshooting (Flow Test)

Trouble	Probable Cause	Remedy
Converter fails to maintain operating pressure.	Pressure closing valve out of adjustment.	Adjust (paragraph 4-71, step 35), or replace pressure closing valve.

Table 4-8. Troubleshooting (Evaporation Loss Test, Buildup and Supply Mode)

Trouble	Probable Cause	Remedy
Excessive weight loss.	Loss of vacuum in sphere assembly.	BCM converter assembly.
Excessive weight loss (evaporation loss test (buildup and supply mode)).	Excessively leaking valves, tubing, and/or fittings.	Replace valves. Tighten or replace fittings. Repeat converter leakage test (paragraph 4-47).
	Pressure closing valve out of adjustment or defective.	Adjust pressure closing valve in accordance with paragraph 4-71, step 35.
		Replace pressure closing valve.
Frosting of sphere assembly.	Loss of vacuum in sphere.	BCM converter assembly.

6. Record time and weight in spaces provided on performance test sheet. Weight loss in 24 hours shall not exceed 5.0 lbs.

NOTE

A converter that loses 5.0 lbs or less in the vented mode and the weight loss is more than in the buildup and supply mode (see example A) shall be considered an acceptable unit. If the weight loss is more than 5.0 lbs (see example B) or if the weight loss is less than it was in the buildup and supply mode (see example C) locate probable cause using troubleshooting chart table 4-9.

Example A:
Weight loss
buildup and supply mode = 3.5 lbs.
Weight loss vented mode = 4.0 lbs.
Converter is RFI.

Example B:
Weight loss
buildup and supply mode = 4.0 lbs.
Weight loss vented mode = 6.0 lbs.
Locate probable cause
using troubleshooting chart.

Example C:
Weight loss
buildup and supply mode = 4.0 lbs.
Weight loss vented mode = 3.0 lbs.
Locate probable cause
using troubleshooting chart.

7. Remove fill valve adapter installed in step 1.

WARNING

Ensure that all personnel safety precautions are observed during converter drain.

8. Place converter in LOX drain pan and drain converter completely of all LOX.

4-53. CONVERTER CHARGE. To charge the converter, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Coupling, Quick-disconnect (Female)	59A120-B5-14
1	Hose Assembly, Stand, Test	59A120-B5-14
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

Table 4-9. Troubleshooting (Evaporation Loss Test, Vented Mode)

Trouble	Probable Cause	Remedy
Excessive weight loss (evaporation loss test (vented)).	Loss of vacuum in sphere assembly.	BCM converter assembly.
Weight loss in vented mode is less than buildup and supply weight loss.	Excessively leaking valves, tubing, and/or fittings when unit failed buildup and supply mode evaporation loss test.	Replace valves. Tighten or replace fittings. Repeat converter leakage test (paragraph 4-47).
	Pressure closing valve out of adjustment or defective when unit failed buildup and supply mode evaporation loss test.	Adjust pressure closing valve in accordance with paragraph 4-71, step 35.
		Replace pressure closing valve.
Excessive frosting of sphere assembly.	Loss of vacuum in sphere.	BCM converter assembly.

CAUTION

Upon completion of bench test, converter shall be charged with gaseous oxygen to 25 to 30 psig to prevent entry of moisture and other contaminants during shipment/storage.

1. Secure converter in rack provided on test stand counter top.

2. Connect quick-disconnect coupling to test stand hose assembly.

3. Using hose assembly, connect test stand BELL JAR BOTTOM COUPLING (C-1) to converter quick disconnect coupling (16, figure 4-15).

4. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

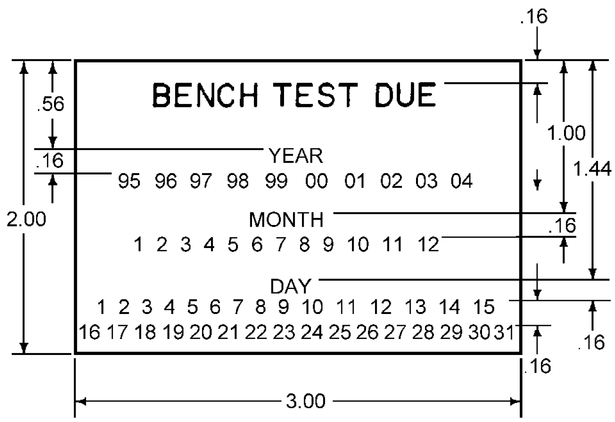
5. Using OXYGEN SUPPLY valve (V-6), charge converter to 25 to 30 psig. Pressure will be indicated on TEST PRESSURE gage (PG-1).

6. Close OXYGEN SUPPLY valve (V-6) disconnect hose assembly connected in step 2 and bleed test stand using SYSTEM BLEED valve (V-5). Secure all test stand valves.

7. Test stand operator and CDI sign Performance Test Sheet. Retain Performance Test Sheet until next scheduled Bench Test is performed.

8. Mark due-date of next Bench Test on bench test decal (figure 4-12). Due date shall be 231 days from last Bench Test date. Affix decal to converter in a position in which it will be visible when converter is installed in aircraft.

9. Annotate station/ship performing Bench Test on a serviceable condition label and affix to bench test decal so as not to interfere with marked due date.



NOTES:

1 MATERIAL SHALL BE ELASTOMERIC PRESSURE SENSITIVE TYPE ADHESIVE BACKED, IN ACCORDANCE WITH MIL-M-43719, TYPE I, CLASS 1.
2 ALL LETTERS AND NUMBERS SHALL APPROXIMATELY MATCH GREEN NO. 14187 OF FED. STD. NO. 595; BACKGROUND SHALL APPROXIMATELY MATCH WHITE NO. 17875 OF FED. STD. NO. 595.
3 BENCH TEST DUE SHALL BE 18-POINT GOTHIC (SANS SERIF) LETTERING. ALL OTHER NUMBERS AND LETTERS SHALL BE 10-POINT, GOTHIC (SANS SERIF).

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Figure 4-12. Bench Test Decal

NOTE

Bench test decals may be procured from Customer Service at the nearest NARF.

10. Install dust covers or plugs in/on all open couplings prior to shipping or storage of converter.

4-54. DISASSEMBLY.

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical over-pressurization, immediately comply with the emergency pressure relief procedures given in paragraph 4-28 at the beginning of this section.

4-55. Disassemble the liquid oxygen converter using index numbers assigned to figure 4-15, unless otherwise noted. Disassemble the converter only as far as necessary to correct any malfunctions. Disassemble the converter as follows:

CAUTION

All disassembly, inspection, repair and assembly must be done on benches having good lighting and in an area provided with air conditioning. Walls, floor and ceiling should have a smooth finish, and be painted with a non-chalking paint which can be kept clean and dust free. It is desirable to keep all parts for each individual LOX converter separated. Make careful note of the location, angle of fitting, and quantity of all parts. Plastic partitioned boxes should be used to keep the parts segregated and protected from dirt and moisture. Plastic bags are also useful for storing subassemblies and component parts after cleaning and inspection until ready for assembly.

NOTE

No special tools are required to disassemble, adjust or assemble this converter.

1. Remove two bolts (8), and remove handle (7).

2. Remove handle clamp (9) by removing two nuts (10) and two screws (11).

3. Remove two electrical clips (57) by removing nuts (58) and screws (59). This will free dust cap assemblies (60, 61).

4. Remove one electrical clamp (62) nut (63) and screw (64).

5. Remove three cable clamp assemblies (62) by removing three nuts (63) from mounting cradle assembly (67).

6. Disconnect and remove capacitance cable assemblies (65, 66).

CAUTION

To prevent damage to tube assemblies, hold up fittings (nipples, elbows, etc.) with backup wrench when removing tube nuts. Remove tube assemblies carefully.

7. Remove supply tube assembly (12) by loosening tube nuts at each end.

8. Remove quick-disconnect coupling assembly (16 from supply manifold (17).

9. Remove supply manifold (17) by removing four nuts (18) and four screws (19).

10. Remove two tube clamps (20) by removing nut (21) and screw (22).

11. Remove fill tube assembly (23) by loosening tube nuts.

12. Remove three tube clamps (26) by removing nut (27) and screw (28).

13. Remove vent tube assembly (29), relief tube assembly (32) and buildup tube assembly (35) by loosening tube nuts at each end of each tube.

14. Remove fill buildup and vent valve mounting strap assembly (39) by removing two nuts (40) and screw (41). (One nut is on threaded part of strap (39).)

15. Remove fill, buildup and vent valve (43) by removing two nuts (44) and screws (45).

16. Remove quick-disconnect coupling (37) and vent fitting (38) from combination valve vent port.

17. Remove burst disc (31) from 90° elbow (30).

18. Remove elbows (25) and (30) from two pipe elbows (42). Remove two pipe elbows (42) from gas port and fill port respectively.

19. Remove two 45° elbows (34, 36) from vent fitting (38) and buildup fitting respectively.

NOTE

In order to remove relief valve (49) and pressure closing valve (50), it will be necessary to first remove the sphere (77).

20. Disconnect buildup coil tube (73) at nipple (56) on supply T-assembly (55) by loosening the tube nut.

21. Remove four cradle assembly mounting nuts (68).

22. Carefully remove two forward cradle mounting bolts from converter base, two ferrules (72), two tube clamps (69), and two lock washers (71).

23. Carefully remove two rear cradle mounting bolts from converter base.

NOTE

Ensure that sphere assembly (77) is not damaged in handling.

24. Remove sphere assembly (77). Remove mounting cradle assembly (67) and strap and handle assembly (76).

25. Remove relief valve clamp (46) by removing two nuts (47) and screws (48).

26. Disconnect buildup coil tube (73) by loosening tube nut from nipple (56) on pressure closing valve (50).

27. Remove pressure relief valve (49) and pressure closing valve (50) from mounting base by removing two nuts (51), screw (52), and screw (53). This will free tube clamp (54).

28. Mount pressure closing valve in vise and remove relief valve.

29. Remove tube elbows, nipples, and other fittings as required for replacement.

4-56. CLEANING.

4-57. To clean the disassembled converter, proceed as follows:

Materials Required

Quantity	Description	Reference Number
1	Wash Bottle	MS36070A
As Required	Bag, Plastic	MIL-B-117
As Required	Nitrogen, Oil-free, Water Pumped, Type I, Class I, Grade B	Fed Spec BB-N-411 NIIN 00-985-7275

WARNING

Do not use oil, or any material containing oil, in conjunction with oxygen equipment. Oil, even in a minute quantity, coming in contact with oxygen can cause explosion or fire. Dust, lint, and fine metal particles are also dangerous.

1. Clean all metallic parts in accordance with procedures outlined in NAVAIR 13-1-6.4-1. Blow dry with oil-free nitrogen.

2. Prior to installation, wash all silicone rubber parts in distilled water and blow dry with oil-free nitrogen.

3. After cleaning, surfaces shall be examined for cleanliness. Should further contamination be found, reclean the parts in accordance with step 1.

4. Cleaned parts shall be sealed in plastic bags for storage. Bag all complete assemblies that are not immediately returned to service.

4-58. INSPECTION OF DISASSEMBLED PARTS.

4-59. Inspect the disassembled converter and component parts in accordance with table 4-10 and the following special instructions:

1. Inspect all hardware items (nipples, elbows, etc.) for stripped threads, burrs, nicks, distortion, rust, corrosion, or other defects.

Table 4-10. Inspection of Disassembled Parts

Part Nomenclature	Index Number	Inspect For	Remedy
Note: Index numbers in this table refer to figure 4-15.			
Identification and performance plates.	-1 and -3	Legibility, condition and security.	Secure in place.
Warning and bench test decals.	-5 and -6	Presence and condition.	Replace or apply as required.
Handle.	-7	Bends and cracks.	Replace.
Tubing assemblies.	-12, -23, -29, -32, -35, and -73	Cracks, dents, nicks, scratches, twists or damaged connectors and tube nuts.	Replace.
Elbows and nipples.	All	Cracks, dents and scratches.	Replace.
Male quick-disconnects.	-16 and -37	Visible damage.	Replace.
Supply manifold assembly.	-17	Visible damage.	Replace.
Fill buildup and vent valve.	-43	Cracks, damaged poppet valve, nosepiece or worn helical grooves.	Replace.
Clamps.	All	Security and condition.	Tighten or replace.
Pressure relief and pressure closing valve.	-49 and -50	Cracks or other visible damage. Presence and condition of Glyptal dots. Presence and condition of safety-wire.	Perform bench test.
Mounting strap, mounting cradle and mounting base assembly.	-39, -67, and -78	Cracks, broken welds, chipped paint or other visible damage.	Replace. Restore finish by components, painting (paragraph 4-61).
Sphere assembly.	-77	Excessive dents, chipped paint or other damage.	Refer to paragraph 4-61 for size of acceptable dents. Restore finish by painting (paragraph 4-61).
Dust caps.	-60 and -61	Broken chain or caps.	Replace.
Electrical clip.	-57	Any damage.	Replace.
Cable assemblies.	-66 and -66	Abrasions and other visible damage.	Replace.
Burst disc.	-31	Stripped threads or other damage.	Replace.

NOTE

Because of the method of suspension of shock mounting of the inner container, some looseness can be detected in most containers by shaking the converter vigorously. Some models employ a spring type suspension that eventually loses some tension. Others have a nylon type spacer that experiences slight shrinkage. Looseness and rattles become more apparent with age. Some looseness can be detected in many new containers. Looseness or rattles is not a criterion for determining serviceability. The integrity of the container is determined by the 24 hour Evaporation Loss Test.

4-60. REPAIR.

4-61. Repair of the converter assembly is limited to replacing defective components, minor repairs (small dents, scratches, abrasions, nicks, etc) of tubing and sphere assembly, reattachment of pinch-off tube protective cover, and touching-up painted surfaces. To make minor repairs, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Adhesive	NIIN 00-738-6429
As Required	Bushing, Rubber	AN3420-6A
As Required	Glyptal	1201B (CAGE 24452)
As Required	Lacquer-Cellulose Nitrate, Glass Color 622, Jet Black	MIL-L-7178
As Required	Lockwire	MS20995C20
As Required	Paint, Green, (Color 14187) (Note 1)	—

Notes: 1. Use any available green paint, chip color 14187, approved by local Environmental Protection Agency.

1. Tubing assemblies with minor dents not causing flow restriction are considered serviceable. Small scratches, abrasions, and nicks can be smoothed with a burnishing tool or aluminum wool.

2. To avoid burnishing the same area more than once, each burnished area shall be identified by a painted band. Color and size of bands are as follows:

a. Color bands shall cover an area not less than 2 inches, nor more than 3 inches in length.

b. Green lacquer shall be used on black and aluminum tubing.

c. Black lacquer shall be used on green tubing.

d. If tubing is repainted, reidentify burnished area.

3. Areas found to be susceptible to scratching, abrasions, and nicks may be further protected by splitting a length of rubber bushing and placing it around the effected area. Secure bushing in place by wrapping one turn of lockwire at each end.

4. Tubing nicked, abraded, or scratched in an area previously identified as burnished shall be condemned.

5. Sphere assemblies containing minor dents are considered serviceable, provided the sphere passes the vented evaporation loss test. Normally, dents up to 3/8-inch deep will not affect function of the sphere.

WARNING

When painting converter, ensure that fittings, tubing, and valves are removed or masked prior to painting. Paint and other foreign matter associated with painting introduced into these components could create an explosion hazard when contacting oxygen.

6. Sphere assemblies passing the vented evaporation loss test and having dents shall be identified by painting.

NOTE

Converters that have actually been critically overpressurized will not pass the bench test. The integrity of the annular space has been lost during the critical overpressurization stage. These converters will frost at the dime like protrusion area and the converter will not pass the evaporation loss test.

Prior to replacing pinch-off tube protective cover, an evaporation loss test (vented condition) shall be performed in accordance with paragraph 4-52. This will ensure that the pinch-off tube was not damaged by whatever force loosened the protective cover.

7. Converters that have partial dime like impressions which were caused by rough handling or improper packaging will normally pass the bench test and can be certified RFI. The partial dime like impressions in this case shall be treated as a dent and painted black and the converter returned to service. If the converter happens to overpressurize in the future there will be a frosting on top of the sphere in the area of the painted dot and a dime like protrusion will begin to form.

8. Pinch-off tube protective covers maybe secured back in place over the pinch-off tube as follows:

a. Clean area surrounding pinch-off tube and flange area of protective cover by sanding followed by cleaning area using procedures outlined in NAVAIR 13-1-6.4-1.

b. Mix equal portion of part "A" resin and part "B" activator. Mix thoroughly following instructions provided with adhesive.

c. Apply adhesive to flange of protective cover. Place cover over pinch-off tube, pressing in place to achieve a good bond. Wipe off excess adhesive and allow cover to remain undisturbed for approximately 8 hours.

4-62. ASSEMBLY.

4-63. Assembly of the liquid oxygen converter assembly is essentially the reverse of disassembly. Test and adjustments are required on certain subassemblies as they are assembled to the converter.

WARNING

Prior to use, inspect leak detection compound. Compound which is not clear and free from suspended material/sediment is considered contaminated and shall be disposed of. Compound exhibiting peculiar odors such as acetone or alcohol is considered contaminated and shall be disposed of.

CAUTION

When installing tubing assemblies, ensure that tubing aligns with fittings to which tube nuts attach. Cross threading should be avoided.

Hold nipples, elbows, tees, etc with backup wrench to avoid twisting or breakage.

4-64. RELIEF VALVE TEST. To test the relief valve on test stand (P/N 59A120) or similar prior to its installation, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567
As Required	Glyptal	1201B (CAGE 24452)
As Required	Lock Wire	MS20995C20

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-B5-8
1	Hose Assembly, Stand, Test	59A120-B5-12
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Ensure test stand is in secured position.

2. Attach test stand adapter to relief valve.

3. Connect relief valve to test stand BELL JAR BOTTOM COUPLER (C-1).

4. Open test pressure GAGE-TO-BELL JAR valve (V-2).

5. Close system bleed valve (V-5) and differential pressure shutoff valve (V-8) and open supply cylinder.

6. Open OXYGEN SUPPLY valve (V-6) and apply 95 psig to valve assembly as indicated on TEST PRESSURE gage (PG-1). Check for leakage around test relief valve and connector with leak detection compound. Correct any test stand leakage prior to proceeding.

7. Install test stand bell jar over relief valve and secure in place.

8. Using hose assembly, connect BELL JAR TOP COUPLING (C-2) to FLOWMETER connection (NIP-4).

9. Turn FLOWMETER SELECTOR valve (V-1) to 0-150 lpm position.

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly and observe TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2) when applying pressure to the relief valve. Damage to the test stand gages could result from rapid surges in pressure.

10. Slowly open OXYGEN SUPPLY valve (V-6) until 100 lpm flow is indicated on FLOWMETER INDICATOR gage (PG-2).

11. With 100 lpm flow indicated on FLOWMETER INDICATOR gage (PG-2) reading on TEST PRESSURE gage (PG-1) shall be 100 to 120 psig.

NOTE

If reading is not within acceptable limits proceed to paragraphs 4-65, 4-66, or 4-67 for adjustment procedures.

12. Using OXYGEN SUPPLY valve (V-6) and SYSTEM BLEED valve (V-5), reduce pressure applied to relief valve to 95 psig as indicated on TEST PRESSURE gage (PG-1).

13. Disconnect test stand hose from FLOWMETER connection (NIP-4).

CAUTION

When attaching test stand hose to FLOWMETER connection (NIP-1), attach slowly while observing FLOWMETER INDICATOR gage (PG-2), excessive relief valve leakage could damage FLOWMETER INDICATOR gage (PG-2).

14. Turn FLOWMETER SELECTOR valve (V-1) to the 0.00.25 lpm position and slowly connect test stand hose to FLOWMETER connection (NIP-1).

15. Maximum allowable leakage as indicated on FLOWMETER INDICATOR gage (PG-2) shall be 0.01 lpm.

16. Relieve pressure using SYSTEM BLEED valve (V-5).

17. Disconnect hose assembly.

18. Remove bell jar.

19. If relief valve vents properly remove the assembly from test stand and disconnect test stand adapter from relief valve, safety wire and apply Glyptal dot in accordance with figure 4-13. Secure the test stand.

20. If relief valve fails to vent properly, or shows excessive leakage, adjust in accordance with corresponding relief valve Adjustment procedures:

4-65. ADJUSTMENT PROCEDURES (ESSEX RELIEF VALVE P/N 20C-0050-2). Adjustment of the Essex Relief Valve (P/N 20C-0050-2) involves 2 potential adjustments (figure 4-13). The valve can normally be brought into tolerance with the pressure adjustment screw, however adjustment of the spring retainer may be required.

Materials Required

Quantity	Description	Reference Number
As Required	Glyptal	1201B (CAGE 24452)
1	Hexagonal Nut	MS35649-242 or equivalent
As Required	Lockwire	MS20995C20
1	Machine Screw	MS35190-228 or equivalent

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-B5-8

NOTE

It may be necessary to adjust the minimum (100 psig) relieving pressure to comply with the maximum allowable leakage (0.01 lpm). This is acceptable, provided the valve relieves 100 lpm at 100 to 120 psig.

1. Thread hexagonal nut on machine screw.

2. Thread machine screw/hex nut assembly into pressure adjustment screw approximately four turns.

3. While holding the machine screw with an appropriate screwdriver, tighten down the hexagonal nut with a 1/4 inch wrench.

4. Remove lockwire from lockscrews, remove Glyptal dots by applying a small amount of acetone.

5. Loosen lockscrew (A).

6. If valve relieves below 100 psig, turn pressure adjusting screw counterclockwise. If relieving above 120 psig, turn adjusting screw clockwise. If valve cannot be adjusted to proper limits, a coarse adjustment must be made using the spring retainer.

7. If valve has been adjusted properly, proceed to step 11.

8. Tighten lockscrew (A).

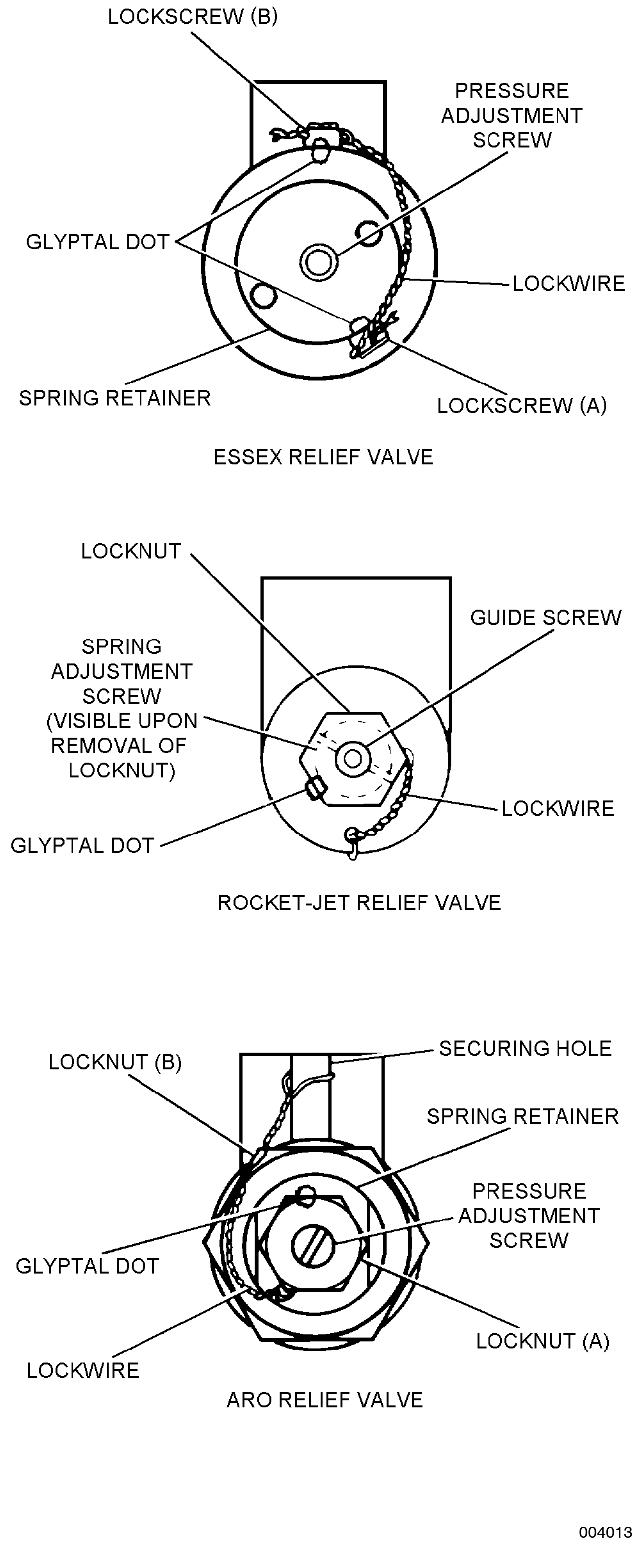


Figure 4-13. Application of Glyptal Dot(s) and Lockwire to Relief Valve

9. Loosen lockscrew (B).

10. If valve relieves below 100 psig, turn spring retainer 1 turn clockwise. If relieving above 120 psig, turn adjusting screw 1 turn counterclockwise. Retighten lockscrew (B). Repeat step 5 and adjust the valve to proper limits. It may be necessary to repeat this step to obtain proper setting. If valve cannot be adjusted to proper limits, it shall be disposed of in accordance with local directives.

11. Tighten both lockscrews.

12. Loosen hex nut and remove the machine screw/hex nut assembly.

13. Retest valve in accordance with paragraph 4-64.

14. Remove valve assembly from test stand and disconnect test stand connector (P/N 59A120-B5-8) from relief valve.

15. Lockwire and apply Glyptal dots in accordance with figure 4-13.

4-66. ADJUSTMENT PROCEDURES (ROCKET-JET RELIEF VALVE P/N 10525-2). Adjustment of the Rocket Jet Relief Valve (P/N 10525-2) involves 3 components of the valve (figure 4-13). The first is a locknut which is used for tightening the complete adjustment assembly. The second is a small guide screw located on the inside of the locknut, which is adjusted using an Allen wrench. This part is not responsible for the performance of the valve. The third part, the spring adjustment screw, adjusts the pressure at which the valve will relieve. It is located under the locknut and can be adjusted by a screwdriver only after removal of the locknut and the guide screw.

Materials Required

Quantity	Description	Reference Number
As Required	Glyptal	1201B (CAGE 24452)
As Required	Lockwire	MS20995C20

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-B5-8

NOTE

It may be necessary to adjust the minimum (100 psig) relieving pressure to comply with the maximum allowable leakage (0.01 lpm). This is acceptable, provided the valve relieves 100 lpm at 100 to 120 psig.

1. Remove lockwire from locknut, remove Glyptal dot by applying a small amount of acetone.

2. Remove locknut using a 3/8-inch wrench.

3. Remove guide screw using a 3/32-inch Allen wrench.

4. If valve relieves below 100 psig, turn spring adjustment screw clockwise with a screwdriver. If valve relieves above 120 psig, turn spring adjustment screw counterclockwise. It may be necessary to repeat this step to obtain proper setting. If spring adjustment screw is removed, teflon tape must be applied to ensure a proper seal. If valve cannot be adjusted to proper limits, it shall be disposed of in accordance with local directives.

CAUTION

Ensure spring adjustment screw does not turn out of adjustment while installing the guide screw and locknut.

5. Reinstall guide screw and turn clockwise until slight resistance is felt (screw bottomed out). Reinstall locknut.

6. Using the Allen wrench, turn the guide screw 2 full turns counterclockwise.

CAUTION

Extreme care should be taken towards keeping the guide screw in its adjusted position when tightening the locknut as deviation from this position could cause the valve not to relieve at any pressure.

7. Tighten the locknut ensuring that the Allen wrench and guide screw are in their adjusted position.

8. Retest valve in accordance with paragraph 4-64.

9. Remove valve assembly from test stand and disconnect test stand connector (P/N 59A120-B5-8) from relief valve.

10. Lockwire and apply Glyptal dot in accordance with figure 4-13.

4-67. ADJUSTMENT PROCEDURES (ARO RELIEF VALVE P/N 21247-1). Adjustment of the ARO Relief Valve (P/N 21247-1) involves 2 potential adjustments (figure 4-13). The valve can normally be brought into tolerance with the pressure adjustment screw, however adjustment of the spring retainer may be required.

Materials Required

Quantity	Description	Reference Number
As Required	Glyptal	1201B (CAGE 24452)
As Required	Lockwire	MS20995C20

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-B5-8

NOTE

It may be necessary to adjust the minimum (100 psig) relieving pressure to comply with the maximum allowable leakage (0.01 lpm). This is acceptable, provided the valve relieves 100 lpm at 100 to 120 psig.

1. Remove lockwire from locknuts, remove Glyptal dot by applying a small amount of acetone.

2. Loosen locknut (A).

3. If valve relieves below 100 psig, turn adjusting screw counterclockwise. If relieving above 120 psig, turn adjusting screw clockwise. If valve cannot be adjusted to proper limits a coarse adjustment must be made using the spring retainer.

4. If valve has been adjusted properly, proceed to step 8.

5. Tighten locknut (A).

6. Loosen locknut (B).

7. If valve relieves below 100 psig turn spring retainer 1 turn clockwise. If relieving above 120 psig, turn adjusting screw 1 turn counterclockwise. Tighten locknut (B). Repeat steps 2 thru 5 and attempt to adjust the valve to proper limits. It may be necessary to repeat this step to obtain proper setting. If valve cannot be adjusted to proper limits, it shall be disposed of in accordance with local directives.

8. Tighten both locknuts.

9. Retest valve in accordance with paragraph 4-64.

10. Remove valve assembly from test stand and disconnect test stand connector (P/N 59A120-B5-8) from relief valve.

11. Lockwire valve from locknut (A) to locknut (B) to securing hole and apply Glyptal dot in accordance with figure 4-13.

4-68. PRESSURE CLOSING VALVE LEAKAGE TEST. To test the pressure closing valve for leakage prior to installation, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	Connector Assembly, Test Stand	59A120-C5-18
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1
1	Plug Assembly, Test Stand	59A120-B5-16

NOTE

Index numbers in parentheses refer to figure 4-14.

1. Plug relief valve port (4) with test stand plug assembly.

2. Attach pressure gage to buildup tube port (6).

3. Attach test stand connector assembly to buildup coil port (5).

4. Attach closing valve to BELL JAR BOTTOM COUPLING (C-1).

5. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

6. Open OXYGEN SUPPLY valve (V-6) and apply 120 psig as indicated on TEST PRESSURE gage (PG-1). Gage attached to buildup tube port (6) should read between 55 and 90 psig.

NOTE

If pressure at buildup tube port does not fall within the 55 to 90 psig limit, adjust pressure closing valve in accordance with paragraph 4-71, step 35.

7. Apply leak detection compound to bellows retainer (3) and valve body. No leakage is allowed. If leakage is noted, replace valve assembly.

8. Ensure that 120 psig is indicated on TEST PRESSURE gage (PG-1). Hold pressure for 5 minutes. Any increase of pressure shown on gage attached to buildup tube port (6) indicates internal leakage and cause for rejection.

9. Close OXYGEN SUPPLY valve (V-6) and bleed test stand using SYSTEM BLEED valve (V-5).

10. Remove pressure closing valve from test stand. Remove plug, gage, and connector from valve. Installation and further adjustments are performed in paragraph 4-71.

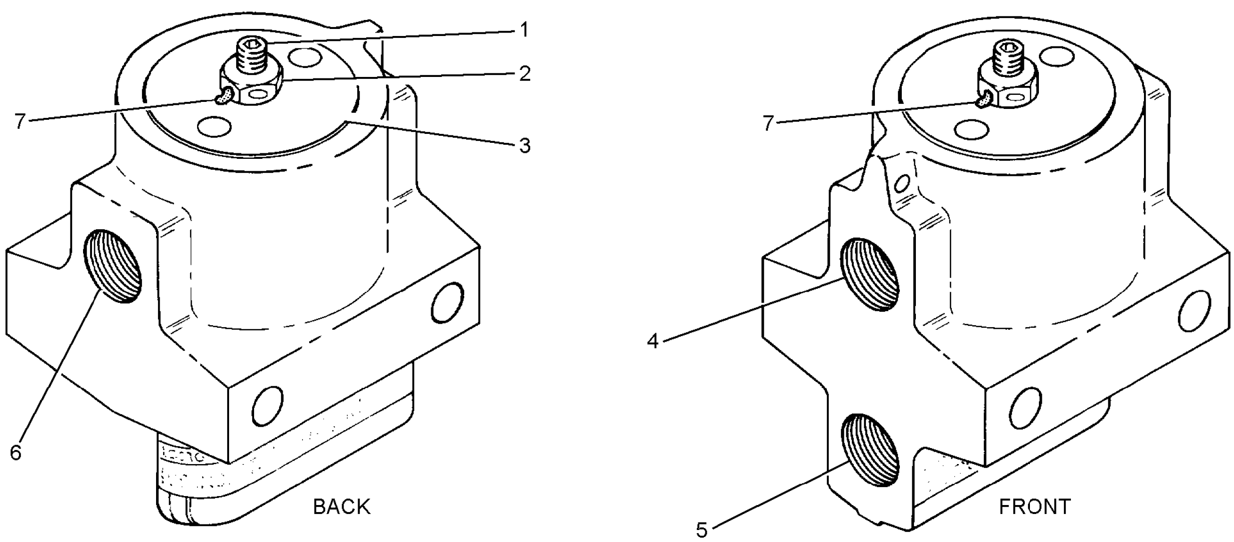
4-69. FILL, BUILDUP AND VENT VALVE TEST. To test the fill, buildup and vent valve for leakage prior to installation, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-B5-8
1	Connector Assembly, Test Stand	59A120-C5-39
1	Hose Assembly, Stand, Test	59A120-B5-12
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1
1	Plug Assembly, Test Stand	59A120-B5-38



1. ADJUSTING SCREW
2. ADJUSTING LOCKNUT
3. BELLOWS RETAINER
4. RELIEF VALVE PORT
5. BUILDUP COIL PORT
6. BUILDUP TUBE PORT
7. GLYPTAL DOT

004014

Figure 4-14. Pressure Closing Valve

1. Plug gas and vent parts of valve using test stand plugs.

2. Attach test stand connector assembly to fill outlet port of valve.

3. Install fill, buildup and vent valve with connector and plugs attached in test stand BELL JAR BOTTOM COUPLING (C-1).

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly when applying pressure to valve. Damage to test stand gages could result from surges in pressure.

4. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2) and close DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8).

5. Open OXYGEN SUPPLY valve (V-6) and apply 70 psig to valve assembly. Check for leakage around test stand plugs and couplings with leak detection compound. Correct any test stand leakage prior to proceeding.

6. Install test stand bell jar over fill, buildup and vent valve, and secure in place.

7. Using test stand hose assembly, interconnect BELL JAR TOP COUPLING (C-2) and FLOWMETER Connection (NIP-1).

8. Turn FLOWMETER SELECTOR valve (V-1) to the 0.0-0.25 lpm position.

CAUTION

When applying pressure in step 9, observe both TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2). Excessive leakage could damage FLOWMETER INDICATOR gage (PG-2).

9. Maintain 70 psig to the fill, buildup and vent valve for 2 minutes. Leakage from the fill inlet port, indicated on FLOWMETER INDICATOR gage (PG-2) shall not exceed 0.02 lpm.

10. Close OXYGEN SUPPLY valve (V-6). Bleed pressure from test stand with SYSTEM BLEED valve (V-5).

CAUTION

Ensure pressure is bled from test stand prior to opening DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8). Overpressurization could damage DIFFERENTIAL PRESSURE gage (DF-1).

11. Open DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8).

CAUTION

When applying pressure in step 12, observe both DIFFERENTIAL PRESSURE gage (DF-1) and FLOWMETER INDICATOR gage (PG-2). Excessive leakage could damage FLOWMETER INDICATOR gage (PG-2).

12. Slowly open OXYGEN SUPPLY valve (V-6) to apply 10 inH_2O, as indicated on DIFFERENTIAL PRESSURE gage (DF-1). Maintain pressure for 2 minutes. Leakage, indicated on FLOWMETER INDICATOR gage (PG-2), shall not exceed 0.02 lpm.

13. If leakage in steps 9 or 12 exceeds 0.02 lpm, replace valve.

14. Close OXYGEN SUPPLY valve (V-6). Bleed pressure from test stand SYSTEM BLEED valve (V-5). Close DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8).

15. Remove test stand bell jar. Remove test stand plug from vent port of fill, buildup and vent valve.

16. Place test stand bell jar back in position over fill, buildup and vent valve. Using test stand hose assembly, interconnect bell jar top coupling (C-2) and FLOWMETER connection (NIP-1).

17. Turn FLOWMETER SELECTOR valve (V-1) to the 0.0-0.25 lpm position.

CAUTION

When applying pressure in step 18, observe both TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2).

18. Open OXYGEN SUPPLY valve (V-6) and apply 70 psig to valve assembly. Maintain 70 psig to the fill, buildup and vent valve for 2 minutes. Leakage from the vent port indicated on FLOWMETER INDICATOR gage (PG-2) shall not exceed 0.05 lpm.

19. Close OXYGEN SUPPLY valve (V-6). Bleed pressure from test stand with SYSTEM BLEED valve (V-5).

CAUTION

Ensure pressure is bled from test stand prior to opening DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8). Overpressurization could damage DIFFERENTIAL PRESSURE gage (DF-1).

20. Open DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8).

CAUTION

When applying pressure in step 21 observe both DIFFERENTIAL PRESSURE gage (DF-1) and FLOWMETER INDICATOR gage (PG-2). Excessive leakage could damage FLOWMETER INDICATOR gage (PG-2).

21. Slowly open OXYGEN SUPPLY valve (V-6) to apply 10 inH_2O, as indicated on DIFFERENTIAL PRESSURE gage (DF-1). Maintain pressure for 2 minutes. Leakage, indicated on FLOWMETER INDICATOR gage (PG-2), shall not exceed 0.05 lpm.

NOTE

Vent port leakage is determined by subtracting the leakage noted in step 9 from that shown in step 18 and leakage noted in step 12 from that shown in step 21. In either case, leakage from the vent port shall not exceed 0.05 lpm.

22. If leakage in step 18 or 21 exceeds 0.05 lpm, replace valve.

23. Close OXYGEN SUPPLY valve (V-6). Bleed pressure from test stand with SYSTEM BLEED valve (V-5). Close DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8).

24. Remove test stand hose assembly from BELL JAR TOP COUPLING (C-2) and FLOWMETER connection (NIP-1). Remove bell jar.

25. Remove fill, buildup and vent valve from test stand. Remove plug from gas port and connector from fill outlet port of valve. Set valve assembly aside. Installation will be covered later in this section.

4-70. COMPLETION OF ASSEMBLY.

4-71. To complete assembly of converter components, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Tape, Anti-seize	MIL-T-27730
As Required	Compound, Leak Detection, Type 1	MIL-L-25567
As Required	Glyptal	1201B (CAGE 24452)

CAUTION

When installing tube assemblies, ensure fittings to which tube nuts are to be attached are properly aligned with tube to prevent cross threading. Hold connecting fittings with open end wrench to avoid straining or breakage when tightening. Hold tubing away from other components of converter assembly while tightening so that a minimum 1/16 inch clearance is maintained. It may be necessary to slightly bend some tube assemblies to maintain this clearance. Ensure tubing is not crimped after bending process.

Use anti-seize tape on all male pipe thread fittings. Apply single layer of tape, overlapping ends just enough to avoid gap in tape when fitting is installed. To prevent tube blockage, ensure tape is clear of last thread.

Do not use anti-seize tape on flared or straight thread fittings.

NOTE

Index numbers in parentheses refer to figure 4-15.

1. Assemble two pipe elbows (42) into gas and fill ports of fill, buildup and vent valve (43). Install elbows (25) and (30) into pipe elbows (42).

2. Assemble quick-disconnect coupling assembly (37) and elbow (34) into vent fitting (38).

3. Assemble vent fitting (38) to vent port of fill buildup and vent valve (43).

4. Install elbow (36) into buildup port of fill, buildup and vent valve (43).

5. Prior to installing fill, buildup and vent valve (43), leak test assembled elbows as follows:

a. Cap elbow (36) installed in buildup port.

b. Apply 90 psig to gas port of valve. Check for leakage using leak detection compound.

c. Remove cap installed above and apply 90 psig to fill-out port of valve. Check for leakage using leak detection compound.

d. Correct any leakage prior to installation of valve.

6. Install burst disc (31) in 90° elbow (30), install fill, buildup and vent valve (43) on converter mounting base (78). Secure with mounting strap (39), screws (41 and 45) and nuts (40 and 44).

6A. Install cap assembly (P/N MS27566-1) onto fill, buildup, and vent valve (43) and secure to converter mounting base (78) with screw (P/N AN516C6-8) and self-locking nut (P/N MS20365D632).

7. Assemble elbow (36) to pressure closing valve (50), and elbow (33) to pressure relief valve (49).

8. Install relief valve (49) into pressure closing (50). Install nipple (56) into port provided in pressure closing valve (50).

9. Prior assembled relief valve (49) and pressure closing valve (50), leak test assembled elbows and nipple as follows:

a. Cap elbow (36) and apply 90 pi to nipple (56).

b. Check for leakage using leak detection compound.

c. Correct any leakage prior to installation of valves.

10. Attach relief valve (49) and pressure closing valve (50), as a unit, to converter mounting base (78). Secure relief valve with clamp (46), two screws (48) and two nuts (47).

11. Attach pressure closing valve to converter mounting base (78) with machine screw (52) and self locking nut (51).

12. Attach one end of buildup coil (73) to nipple (56) in pressure closing valve (50). Other end of buildup coil will be attached later in this Section.

13. Install tube clamp (54) over buildup coil assembly (73). Secure with machine screw (53) and self-locking nut (51).

14. Attach dust caps (60 and 61) and electrical clips (57) to mounting cradle assembly (67) with two screws (59) and two nuts (57).

15. Attach low capacitance cable assembly (65) and high capacitance cable assembly (66) to mounting assembly (67). Use rubber washer, lockwasher and nut provided with each cable assembly. Place dust covers (60 and 61) over cable terminal.

16. Route low and high capacitance cable assemblies (65 and 66) along mounting cradle assembly (67), securing with electrical clamps (62), screws (64) and self locking nuts (63).

17. Attach converter handle (7) to mounting cradle (67) with two bolts (8). Install handle clamp (9) using two screws (11) and two nuts (58).

18. Place strap and handle assembly (76) over sphere assembly (77). Position just above circumferential seam of sphere, with handle directly above warning decal (5). Secure with nut (74).

19. Place mounting cradle (67) over sphere assembly (77) and attach strap and handle assembly (76). Align mounting cradle so capacitance terminals are directly above handle of strap and handle assembly (76).

20. Attach two nuts (64) and two lock washers (71) to the two forward mounting bolts of the mounting cradle (67).

21. Place two tube clamps (69) on buildup coil (73), and align with holes in forward mounting cradle in converter mounting base assembly (78).

22. Position sphere assembly (77) with attached strap handle (76) and mounting cradle (67) on mounting base assembly (78) so that forward bolts of cradle assembly pass through two tube clamps (69) positioned in step 21, two ferrules (72) and into forward mounting holes in mounting cradle (78). Position aft mounting bolts in holes provided.

23. Secure mounting cradle assembly with four self-locking nuts (68).

24. Attach tube nut at unattached end of buildup coil (73) to nipple (56) in supply tee assembly (55).

25. Attach supply manifold assembly (17) to mounting cradle (78) with four screws (19) and four self-locking nuts (18). Install quick-disconnect assembly (16) into supply manifold assembly (17).

26. Attach buildup tube (35) to elbow (36) in pressure closing valve and elbow (36) in buildup port of fill, buildup and vent valve (43).

27. Attach relief tube (32) to elbow (33) in pressure relief valve and elbow (34) in vent fitting (38).

28. Attach vent tube (29) to converter sphere and to elbow (30) in gas port of fill, buildup and vent valve (43).

29. Attach three tube clamps (26) with screw (28) and self-locking nut (27).

30. Attach fill tube (23) to elbow (25) in fill port of fill, buildup and vent valve (43) and nipple (24) in supply tee assembly (55).

31. Install nipple (13) into port in supply manifold assembly (17).

32. Attach supply tube (12) to nipple (13) in supply manifold assembly and orifice valve (14) in supply tee (55).

33. Install two tube clamps (20), one over fill tube assembly (23) and the other over buildup coil assembly (73). Secure in place using machine screw (22) and self-locking nut (21).

34. After assembly, Bench Test converter in accordance with paragraph 4-40.

35. During post-assembly Bench Test, it may be necessary to adjust pressure closing valve (50) when performing the flow test. If so, proceed as follows:

NOTE

Index numbers in parentheses refer to figure 4-14.

a. Cut and remove lockwire from adjusting locknut (2). Remove Glyptal dot by scraping it with a razor blade.

NOTE

The 70 to 75 psig operating pressure is for adjustment purposes only. If converter maintains 55 to 90 psig, no adjustment is required. If converter pressure is above or below this range, adjust pressure closing valve to maintain 70 to 75 psig.

b. Using an Allen wrench, turn adjusting screw (1) so a supply pressure of 70 to 75 psig is maintained with a flow of 120 lpm. Turning adjusting screw counterclockwise decreases pressure and turning clockwise increases pressure. Flow the converter for at least 15 minutes to ensure pressure is constant.

c. Tighten adjusting locknut (2) and safety-wire, using lockwire (MS20995C20).

d. Apply Glyptal dot (7) to adjusting locknut (2) but not to threads of adjustment screw (1).

Section 4-5. Illustrated Parts Breakdown

4-72. GENERAL.

4-73. This Section lists and illustrates the assemblies and detail parts of the Liquid Oxygen Converter Assembly, Type GCU-24/A, P/N 10C-0016-10A, manufactured by Essex Industries, Inc. (CAGE 83533).

4-74. The Illustrated Parts Breakdown should be used during maintenance when requisitioning and identifying parts.

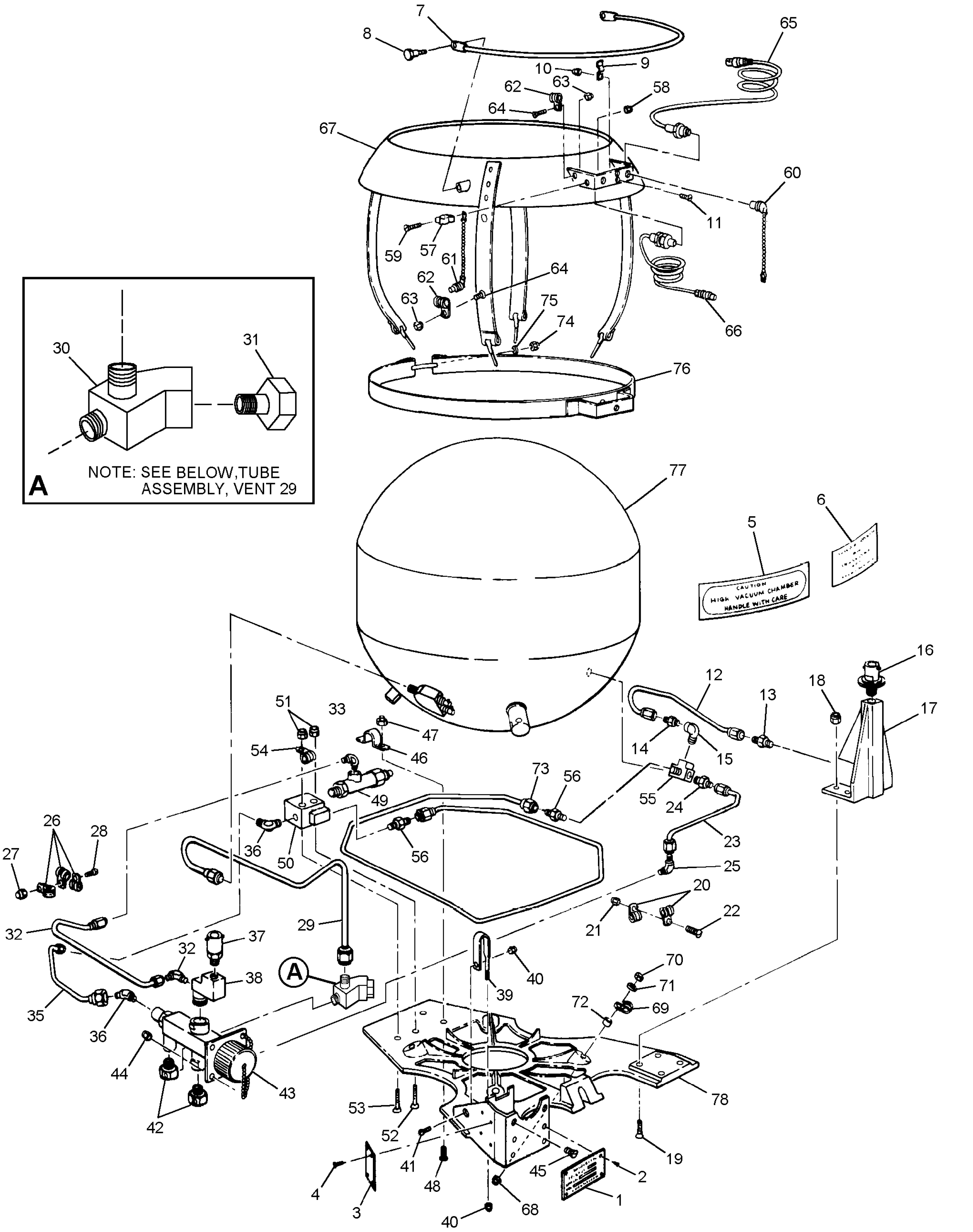


Figure 4-15. Liquid Oxygen Converter, Type GCU-24/A, P/N 10C-0016-10A

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
4-15	10C-0016-10A	CONVERTER ASSEMBLY, Liquid oxygen, ... 10 liter (CAGE 83533)	REF	
-1	10C-0016-0020	. PLATE, Identification .... (ATTACHING PARTS)	1	
-2	AN535-00-2	. SCREW, Drive, Rd. Hd. .... ---*---	4	
-3	10C-0016-0021	. PLATE, Vacuum performance .... (ATTACHING PARTS)	1	
-4	AN535-00-2	. SCREW, Drive, Rd. Hd. .... ---*---	4	
-5	10C-0001-0033	. DECAL, Warning	1	
-6	CL227C2-1	. DECAL, Bench test date	1	
-7	10C-0016-0009	. HANDLE, Converter .... (ATTACHING PARTS)	1	
-8	10C-0016-0026	. BOLT, Hex. Hd. Shld., No. .... 0-32 NF-2A x 5/16 ---*---	2	
-9	10C-0016-008	. CLAMP, Handle .... (ATTACHING PARTS)	1	
-10	AN365D632	. NUT, Self-locking	2	
-11	AN515C6-7	. SCREW, Mach., Rd. Hd. .... ---*---	2	
-12	10C-0016-0041	. TUBE ASSEMBLY, Supply	1	
-13	AN816-5D	. NIPPLE	1	
-14	20C-0009-1	. VALVE, Orifice	1	
-15	AN914-1D	. ELBOW, Internal and external pipe thd	1	
-16	528000-4	. COUPLING ASSEMBLY, Quick-disconnect	1	
-17	10C-0016-0002	. MANIFOLD ASSEMBLY, Supply .... (ATTACHING PARTS)	1	
-18	AN365D1032	. NUT, Self-locking	4	
-19	AN507C1032-14	. SCREW, Mach, Flat Hd. .... ---*---	4	
-20	MS21919DG5	. CLAMP, Tube .... (ATTACHING PARTS)	2	
-21	AN365D632	. NUT, Self-locking	1	
-22	AN515C6-6	. SCREW, Machine, Rd. Hd. .... ---*---	1	
-23	10C-0016-0038	. TUBE ASSEMBLY, Fill	1	
-24	AN816-5D	. NIPPLE	1	
-25	AN822-5D	. ELBOW 90°	1	
-26	MS21919DG5	. CLAMP, Tube .... (ATTACHING PARTS)	3	
-27	AN365D632	. NUT, Self-locking	1	
-28	AN515C6-7	. SCREW, Machine, Rd. Hd. .... ---*---	1	
-29	10C-0016-0039	. TUBE ASSEMBLY, Vent	1	
-30	10C-0016-0060	. ELBOW, 90° (CAGE 83533)	1	
-31	10C-0016-0061	. BURST DISC ASSEMBLY (CAGE 83533)	1	

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
4-15-32	10C-0016-0042	. TUBE ASSEMBLY, Relief	1	
-33	AN822-5D	. ELBOW 90°	1	
-34	AN823-5D	. ELBOW, 45°	1	
-35	10C-0016-0040	. TUBE ASSEMBLY, Buildup	1	
-36	AN823-5D	. ELBOW, 45°	2	
-37	256000-8	. COUPLING ASSEMBLY, Quick-disconnect	1	
-38	10C-0016-0019	. FITTING, Vent	1	
-39	10C-0016-0028	. STRAP ASSEMBLY, Mounting	1	
		(ATTACHING PARTS)		
-40	AN365D1032	. NUT, Self-locking	2	
-41	AN520C10-8	. SCREW, Machine, Rd. Hd	1	
-42	10C-0016-0029	. ELBOW, 90°	2	
		---*---		
-43	439000-3	. VALVE ASSEMBLY, Fill buildup and vent	1	
	0580560100-1	. VALVE ASSEMBLY, Fill buildup and vent	1	
		(ATTACHING PARTS)		
-44	AN365D1032	. NUT, Self-locking	2	
-45	AN507C1032-12	. SCREW, Machine, Flat Hd	2	
-46	10C-0016-0024	. CLAMP, Relief valve	1	
		(ATTACHING PARTS)		
-47	AN365D1032	. NUT, Self-locking	2	
-48	AN507C1032-10	. SCREW, Machine, Flat Hd	2	
		---*---		
-49	20C-0050-2	. VALVE, Pressure relief (Note 1)	1	
-50	20C-0008-1	. VALVE, Pressure closing	1	
		(ATTACHING PARTS)		
-51	AN365D1032	. NUT, Self-locking	2	
-52	AN507C1032-28	. SCREW, Machine, flat hd	1	
-53	AN507C1032-30	. SCREW, Machine, flat hd	1	
		---*---		
-54	MS21919DG5	. CLAMP, Tube	1	
-55	10C-0016-0036	. TEE ASSEMBLY, Supply	1	
-56	AN816-5D	. NIPPLE	2	
-57	10C-0001-0034	. CLIP, Electrical	2	
		(ATTACHING PARTS)		
-58	AN365D632	. NUT, Self-locking	2	
-59	AN515C6-7	. SCREW, Machine Rd. Hd.	2	
		---*---		
-60	10C-0001-0009	. CAP ASSEMBLY, Dust, E polarity (120°)	1	
-61	10C-0001-0008	. CAP ASSEMBLY, Dust, B polarity (180°)	1	
-62	MS21919DG2	. CLAMP ASSEMBLY, Electrical	4	
		(ATTACHING PARTS)		
-63	AN365D632	. NUT, Self-locking	4	
-64	AN515C6-7	. SCREW, Machine Rd. Hd.	1	
		---*---		
-65	10C-0016-0031	. CABLE ASSEMBLY, Low-capacitance, E polarity	1	

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
4-15-66	10C-0016-0032	. CABLE ASSEMBLY, High-capacitance, B polarity	1	
-67	10C-0016-0027	. CRADLE ASSEMBLY, Mounting		
		(ATTACHING PARTS)		
-68	AN365D1032	. NUT, Self-locking	4	
		---*---		
-69	MS21919DG5	. CLAMP, Tube	2	
		(ATTACHING PARTS)		
-70	AN345C10	. NUT, Plain	2	
-71	AN935-10L	. WASHER, Lock	2	
		---*---		
-72	10C-0016-0044	. FERRULE	2	
-73	10C-0016-0043	. COIL ASSEMBLY, Buildup	1	
-74	AN365D832	. NUT, Self-locking	1	
-75	AN960C8	. WASHER, Flat	1	
-76	10C-0016-0017	. STRAP AND HANDLE ASSEMBLY	1	
-77	10C-0016-0035	. SPHERE ASSEMBLY	1	
-78	10C-0016-0010	. BASE, Converter mounting	1	

Notes: 1. Relief valve, P/N 20C-0050-2, P/N 20C-0005-20, P/N 10525-2 (CAGE 97413), and P/N 21247-1 (CAGE 97413), are interchangeable.

NUMERICAL INDEX

Part Number	Figure and Index Number	SM&R Code
AN346C10	4-15-70	
AN365D1032	4-15-18	PAOZZ
	4-15-40	
	4-15-44	
	4-15-47	
	4-15-61	
	4-15-68	
AN365D632	4-15-10	PAOZZ
	4-15-21	
	4-15-27	
	4-15-58	
	4-15-63	
AN365D832	4-15-74	PAOZZ
AN507C1032-10	4-15-48	PAOZZ
AN507C1032-12	4-15-45	PAOZZ
AN507C1032-14	4-15-19	PAOZZ
AN507C1032-28	4-15-52	
AN507C1032-30	4-15-53	PAOZZ
AN515C6-6	4-15-22	PAOZZ
AN515C6-7	4-15-11	PAOZZ
	4-15-28	
	4-15-59	
	4-15-64	
AN520C10-8	4-15-41	
AN535-00-2	4-15-2	PAOZZ
	4-15-4	
AN816-5D	4-15-13	PAOZZ
	4-15-24	
	4-15-56	
AN822-5D	4-15-25	PAOZZ
	4-15-33	
AN823-5D	4-15-34	PAOZZ
	4-15-36	
AN914-1D	4-15-15	PAOZZ
AN935-10L	4-15-71	PAOZZ
AN960C8	4-15-75	PAOZZ
CL227C2-1	4-15-6	
MS21919DG2	4-15-62	PAOZZ
MS21919DG5	4-15-20	PAOZZ
	4-15-26	

Part Number	Figure and Index Number	SM&R Code
	4-15-54	
	4-15-69	
0580560100-1	4-15-43	PAOZZ
10C-0001-0008	4-15-61	PAOZZ
10C-0001-0009	4-15-60	PAOZZ
10C-0001–0033	4-15-5	
10C-0001-0034	4-15-57	PAOZZ
10C-0016-0002	4-15-17	PAOZZ
10C-0016-0008	4-15-9	PAGZZ
10C-0016-0009	4-15-7	PAOZZ
10C-0016-4010	4-15-78	
10C-0016-0017	4-15-76	PAOZZ
10C-0016-0019	4-15-38	PAOZZ
10C-0016-0020	4-15-1	
10C-0016-0021	4-15-3	
10C-0016-0024	4-15-46	
10C-0016-0006	4-15-8	
10C-0016-0027	4-15-67	PAOZZ
10C-0016-0028	4-15-39	PAOZZ
10C-0016-0029	4-15-42	PAOZZ
10C-0016-0031	4-15-65	PAOZZ
10C-0016-0032	4-15-66	PAOZZ
10C-0016-0035	4-15-77	
10C-0016-0036	4-15-55	PAOZZ
10C-0016-0038	4-15-23	PADZZ
10C-0016-0039	4-15-29	PAOZZ
10C-0016-0040	4-15-35	PAOZZ
10C-0016-0041	4-15-12	PAOZZ
10C-0016-0042	4-15-32	PAOZZ
10C-0016-0043	4-15-73	PAOZZ
10C-0016-0044	4-15-72	
10C-0016-0060	4-15-30	PADZZ
10C-0016-0061	4-15-31	PADZZ
10C-0016-10A	4-15-	PROGD
20C-0008-1	4-15-50	PAOZZ
20C-0009-1	4-15-14	PAOZZ
20C-0050-2	4-15-49	PAOZZ
25600-8	4-15-37	
439000-3	4-15-43	PAOZZ
528000-4	4-15-16	PAOZZ

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CHAPTER 5

LIQUID OXYGEN CONVERTER ASSEMBLY

TYPE GCU-24/A, P/N 10C-0016-16

Section 5-1. Description

5-1. GENERAL.

5-2. The Liquid Oxygen Converter Assembly, Type GCU-24/A, P/N 10C-0016-16, (figure 5-1) is manufactured by Essex Industries, Inc. (CAGE 19062). The converter assembly is designed to store and convert liquid oxygen (LOX) into gaseous oxygen for the aircrewmember during flight. Table 5-1 contains the leading particulars for the converter assembly.

NOTE

Air Force Liquid Oxygen Converter Assembly, Type GCU-24/A, P/N 10C-0016-15, does not meet Navy vibration standards and shall be removed from service and forwarded to depot maintenance for disposition.

5-3. Oxygen in its liquid state (approximately -297°F (-182°C)), is stored in a spherical assembly consisting of inner and outer shells separated by an annular space. The annular space is evacuated, creating a vacuum, preventing the transmittal of heat through the space. The thermos bottle effect created retards heating and eventual conversion of LOX to gaseous oxygen. Valves, tubing and fittings incorporated in the converter assembly converts LOX to gas and directs its flow at a controlled rate.

5-4. CONFIGURATION.

5-5. The Liquid Oxygen Converter Assembly, Type GCU-24/A, P/N 10C-0016-16, consists of a sphere assembly, buildup and vent valve, relief valve, pressure closing valve, and associated tubing and fittings. A capacitance-type probe assembly, which sends an electrical signal to a liquid oxygen quantity gage located in the aircraft, is incorporated within the sphere assembly. The quantity gage indicates the amount of LOX, in liters, contained in the converter.

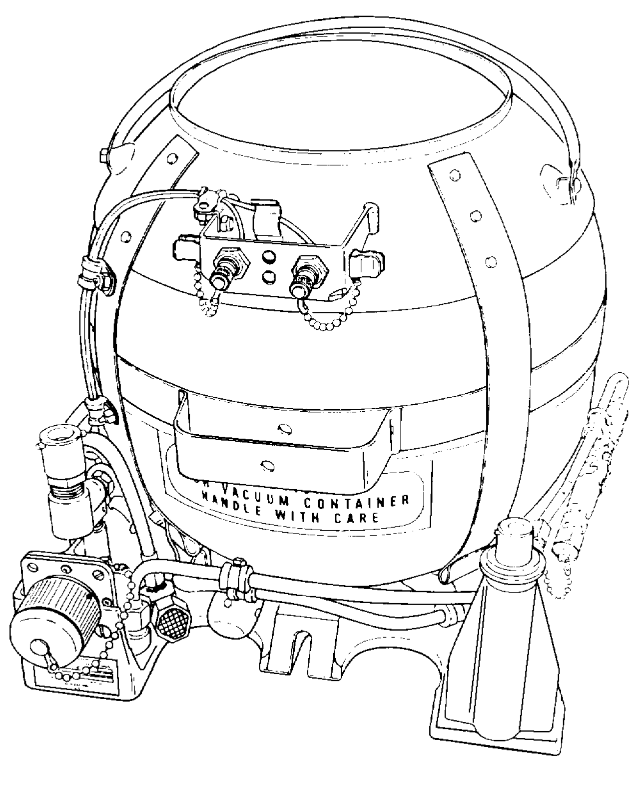

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Figure 5-1. Liquid Oxygen Converter Assembly, Type GCU-24/A, P/N 10C-0016-16

Table 5-1. Leading Particulars

Capacity (LOX)	10 liters
Operating pressure	55 to 90 psig
Operating temperature range	-65°F (-54°C) to +260°F (+127°C)
Relief valve setting	100 to 120 psig
Pressure closing valve setting	55 to 90 psig
Delivery rate	120 lpm (min)
Filling time at 70°F	10 min
Buildup time (max)	5 min
Burst disc rupture range	225 psig at 72°F

5-6. FUNCTION.

5-7. Operational characteristics and performance of the GCU-24/A converter assembly (P/N 10C-0016-16) are as follows:

1. Filling the converter is accomplished by attaching the filler valve of the LOX servicing trailer to the fill port of the fill, buildup, and vent valve. When the filler valve is connected, it depresses the nosepiece and valve poppet of the fill, buildup, and vent valve so that the vent, fill and gas ports are open and the buildup port is closed. This places the converter into the Fill Mode (figure 5-2).

2. In the Fill Mode, gas pressure built up within the converter will be vented to the atmosphere. As the sphere pressure drops below the LOX servicing trailer pressure, LOX begins to flow from the servicing trailer into the bottom of the inner sphere via the fill tubing.

3. As the LOX level rises in the sphere, pressure created by vaporization of the liquid due to heat, turbulence, etc. is vented to the atmosphere. The converter is considered full when a steady stream of LOX flows out of the vent quick-disconnect.

4. Once the converter is full, the servicing trailer valve is disconnected and the poppet assembly returns to its normal position. The converter is now in the Buildup Mode-Phase I (figure 5-3). In this phase, the fill and vent ports are closed and the buildup and gas ports are open.

5. LOX which is in the fill line vaporizes and creates a pressure within the buildup coil. A small amount of LOX also is forced from the bottom of the converter by gravity. This LOX vaporizes and further increases the pressure in the buildup coil. As the pressure builds (approximately 75 psig), the bellows in the pressure closing valve contracts and closes the valve. The converter is now in the Buildup Mode Phase II (figure 5-4).

6. Because a demand has not yet been placed on the converter, the pressure continues to rise slowly due to the vaporization of LOX until the pressure reaches approximately 110 psig. The converter is now in the Buildup Mode-Phase III (figure 5-5). At this point, the relief valve will open and release any pressure in excess of the relief valve opening pressure. Once the excess pressure is relieved, the relief valve will then close. The converter will continue to repeat this phase until a demand is placed on the converter.

7. If the pressure within the converter sphere was allowed to rise without control, the pressure could increase to over 12,000 psig. Because the converter assembly can only withstand about one tenth of this pressure, pressure relief devices are necessary. In addition to the relief valve, a burst disc was added to the converter at the gas port of the fill, buildup, and vent valve. The burst disc will rupture at 225 psig at 72°F thus relieving excess pressure in the event of a converter malfunction.

8. The pressure in the sphere will remain at the relief valve opening pressure until an oxygen demand is placed on the converter. When a flow is drawn from the supply quick-disconnect, the converter is placed in the Supply Mode (figure 5-6). As gaseous oxygen is drawn from the supply line, pressure in the buildup coil decreases allowing LOX to flow from the sphere into the buildup coil.

9. The converter has then returned to the buildup mode (Phase I-III). The flow of LOX from the bottom of the sphere decreases the head pressure. The decrease in pressure opens the pressure closing valve and allows more LOX to flow into the buildup coil from the bottom of the sphere. LOX now in the buildup coil vaporizes, the pressure increases to approximately 75 psig, and the pressure closing valve closes again. This cycle continues and maintains a working pressure of approximately 75 psig while supplying gaseous oxygen at a rate of 120 lpm.

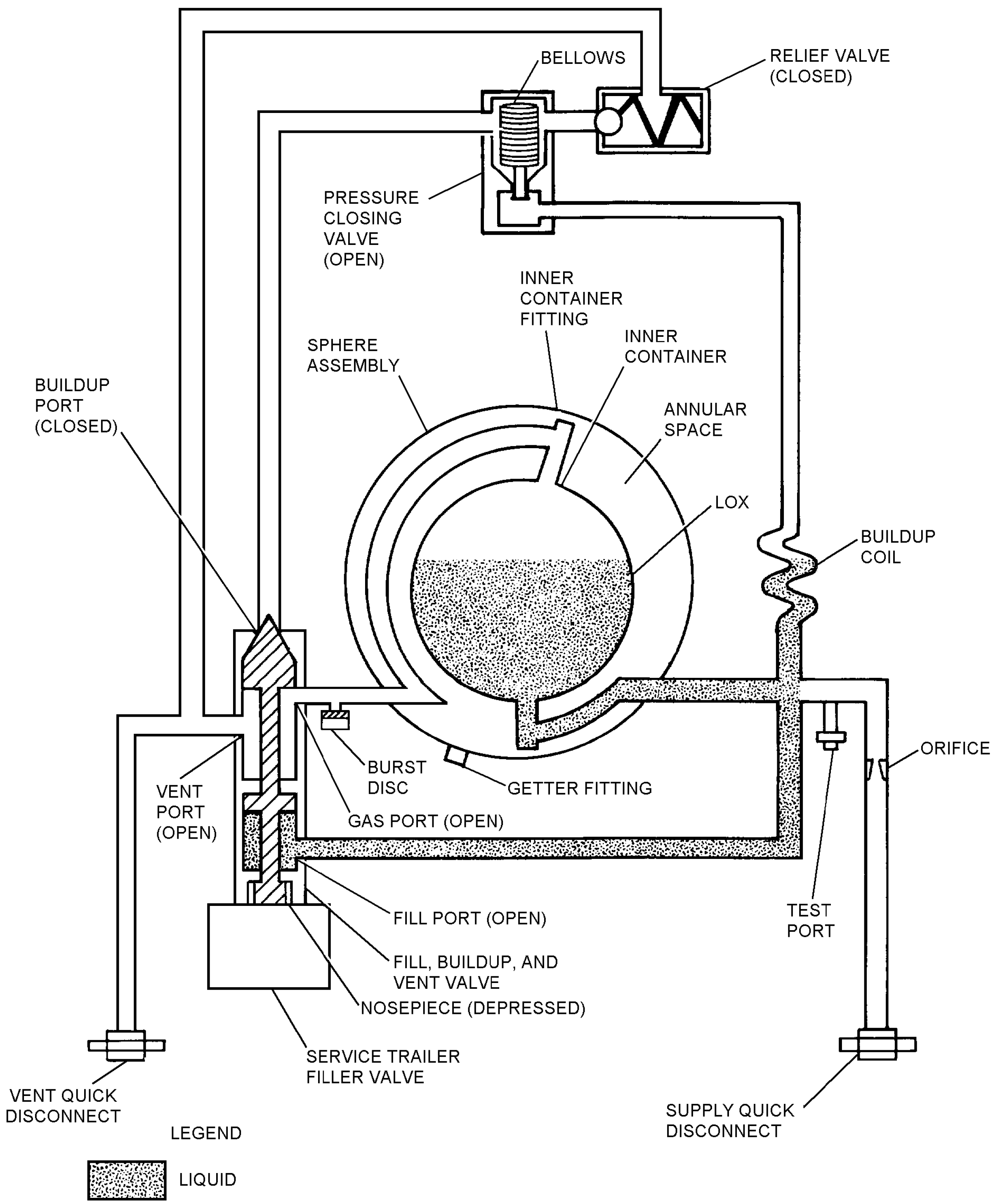


Figure 5-2. Fill Mode (Converter Removed from Aircraft)

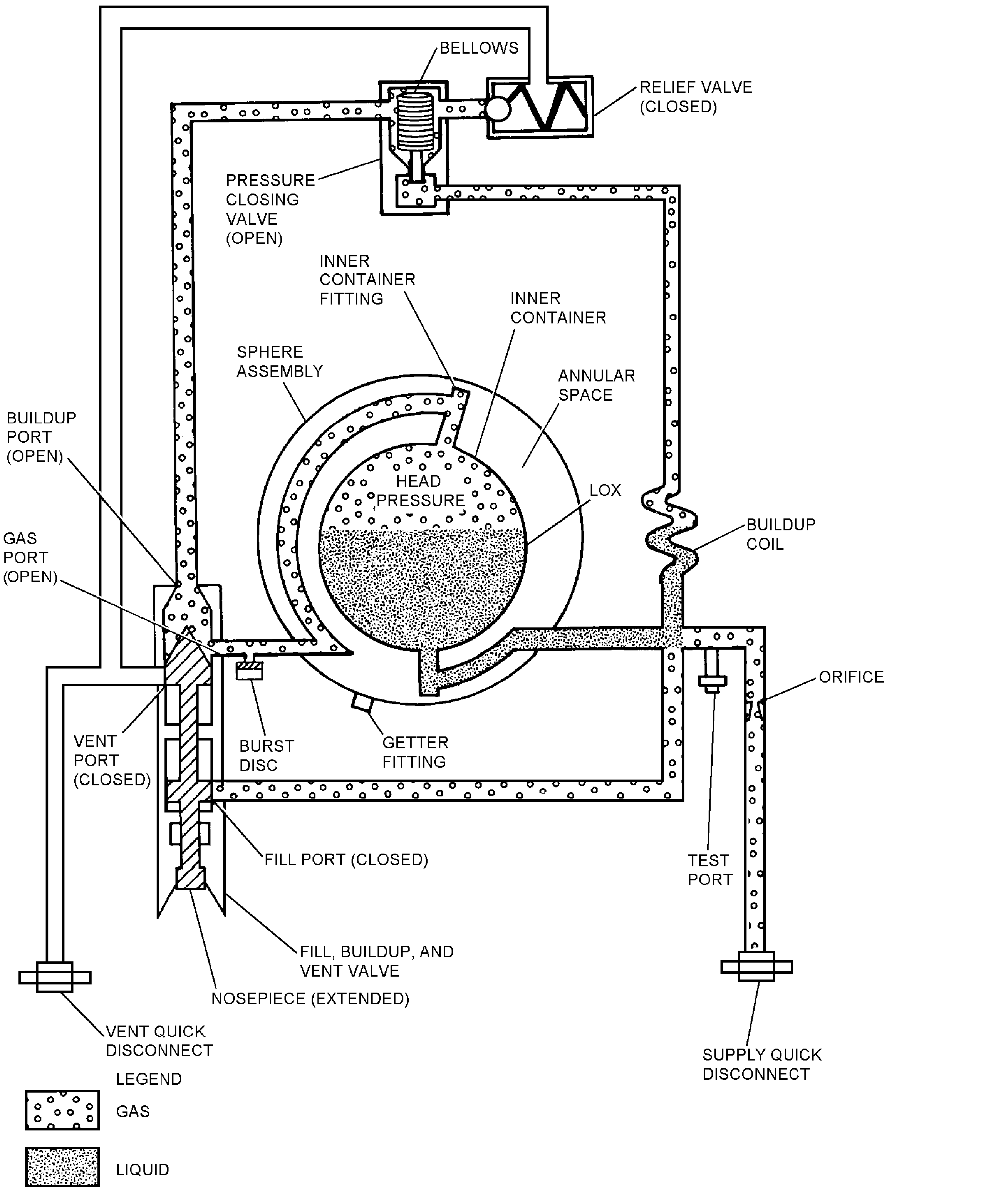


Figure 5-3. Buildup Mode – Phase I (Converter Removed from Aircraft)

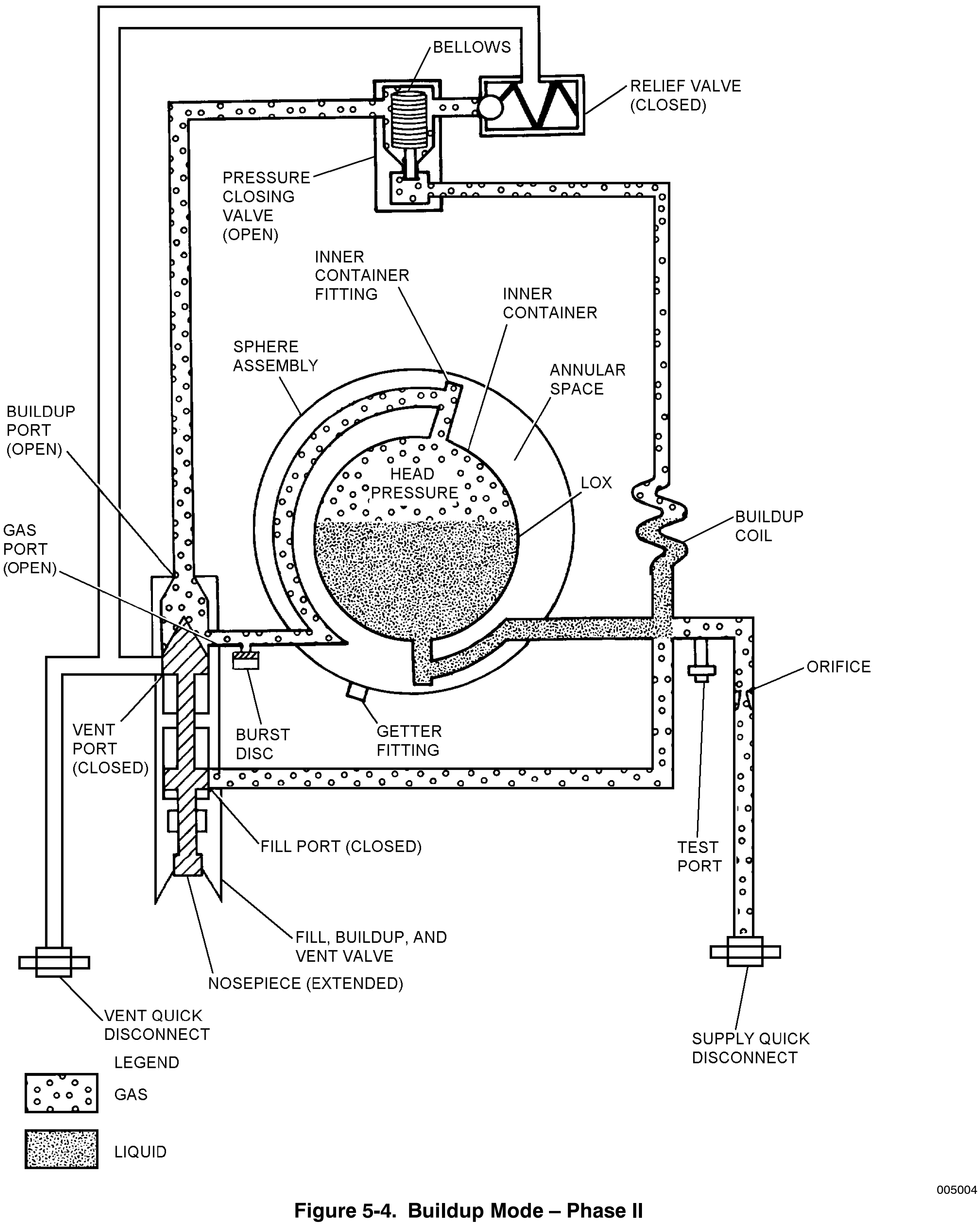


Figure 5-4. Buildup Mode – Phase II

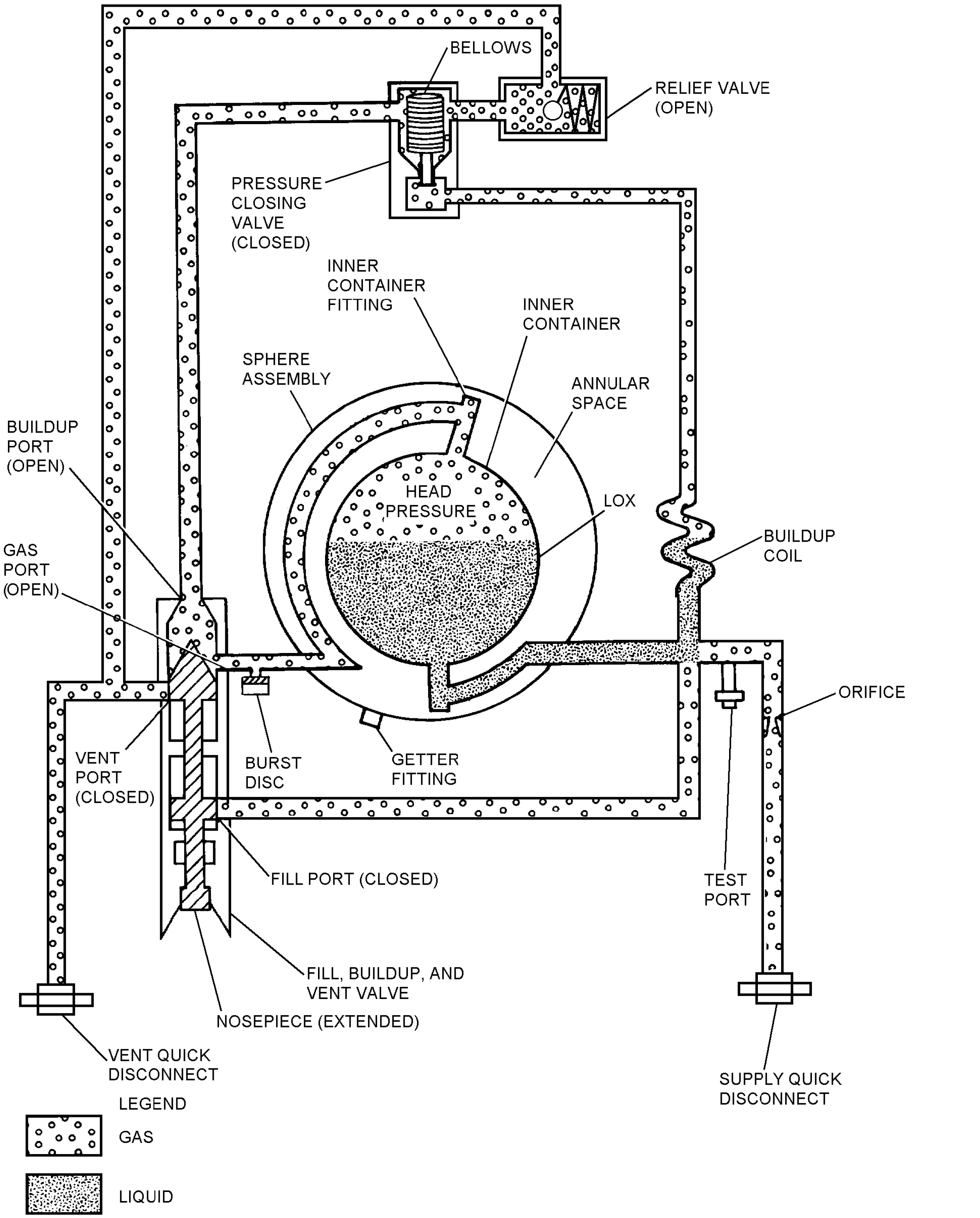


Figure 5-5. Buildup Mode – Phase III

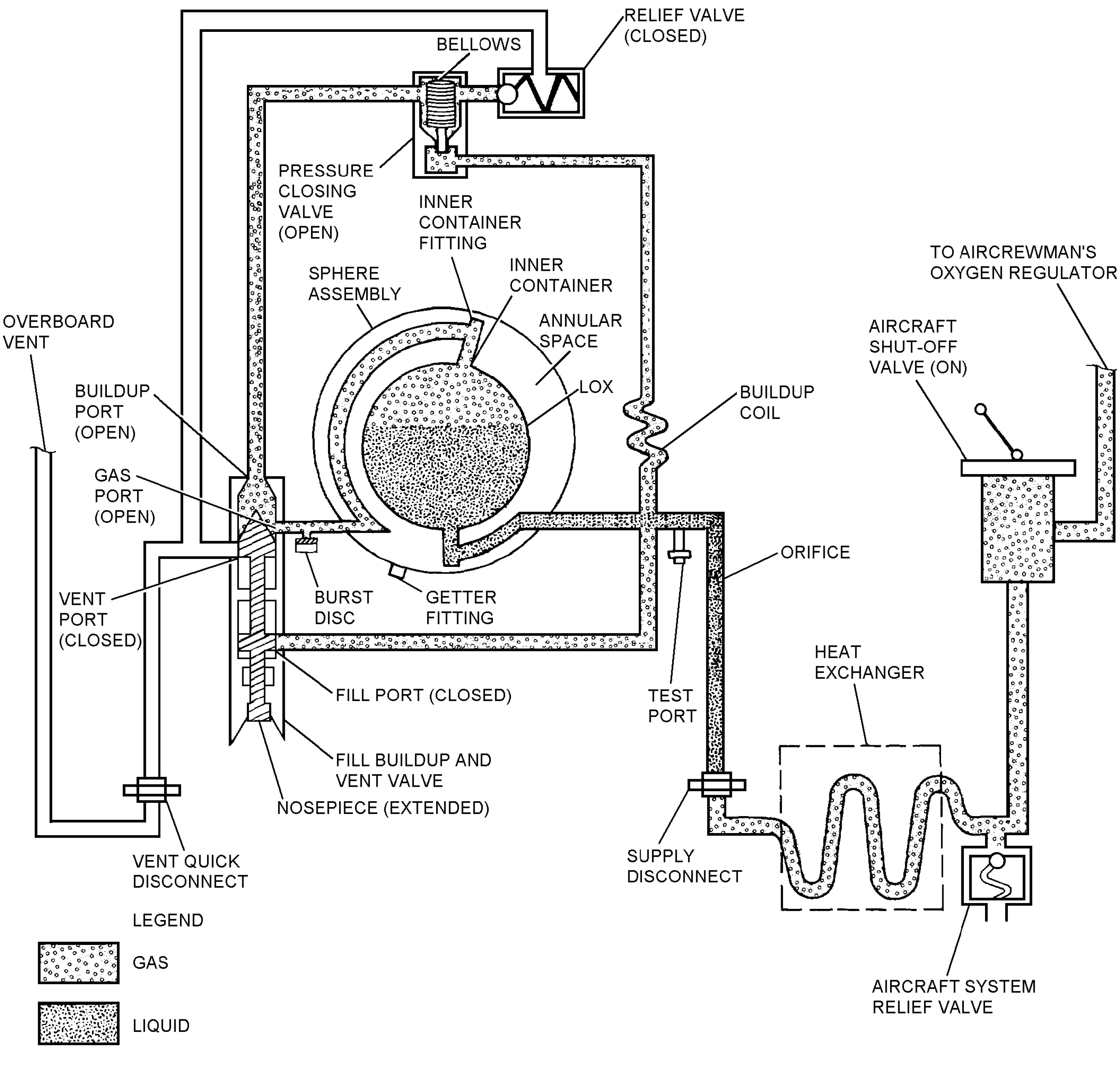


Figure 5-6. Supply Mode (Converter Installed)

10. The gaseous oxygen travels from the buildup coil through the supply quick disconnect to an aircraft heat exchanger where the gaseous oxygen is warmed to a breathable temperature. The gaseous oxygen continues onto the aircraft shutoff valve.

5-8. SERVICE LIFE.

5-9. Liquid oxygen converters shall remain in service as long as they continue to function properly.

5-10. REFERENCE NUMBERS, ITEMS AND SUPPLY DATA.

5-11. Section 5-5, Illustrated Parts Breakdown, contains information on the converter assembly, subassemblies and component parts. Figure and index numbers, reference or part numbers, description, and units per assembly are provided with the breakdown.

Section 5-2. Modifications

5-12. GENERAL.

5-13. There are no modifications to the GCU-24/A (P/N 10C-0016-16) required/authorized at this time.

Section 5-3. Performance Test Sheet Preparation

5-14. GENERAL.

5-15. Preparation of the Liquid Oxygen Converter Performance Test Sheet (figure 5-7) utilized during bench test requires entering the appropriate indicated flows and pressures in the spaces provided. The indicated flows and pressures shall be extracted from the test stand calibration correction cards. Refer to appropriate ground support equipment manual.

5-16. The test stand calibration correction cards contain all actual flows and pressures required to test all known models of liquid oxygen converters presently in service. Converting actual flows and pressures to indicated flows and pressures is normally accomplished during calibration of the test stand. Refer to appropriate ground support equipment manual for calibration intervals.

5-17. The Performance Test Sheet shall be prepared as shown in figure 5-7. The Performance Test Sheet shown is a sample, but may be reproduced for local use.

5-18. The following tests require the extraction of appropriate indicated allows and/or pressures from the test stand calibration correction cards:

Relief Valve Test
Converter Leakage Test
Fill and Buildup Time Test
Flow Test
Converter Charge

NOTE

For correction card numbers refer to appropriate ground support equipment manual.

5-19. CONVERTER PERFORMANCE TESTS.

5-20. RELIEF VALVE TEST. The relief valve shall vent at least 100 liters per minute (lpm) with an applied pressure of 100 to 120 psig. The maximum allowable leakage with 95 psig applied is 0.01 lpm. Make the following entries on the Performance Test Sheet:

1. Locate the indicated inches of water (inH_2O) for 100 lpm on correction card number 4. Enter indicated inH_2O in space provided on Performance Test Sheet.

2. Locate the indicated psig for the actual pressures of 95, 100 and 120 psig on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

3. Locate the indicated inH_2O for the actual flow of 0.01 lpm on correction card number 7. Enter the indicated inH_2O in space provided on Performance Test Sheet.

5-21. CONVERTER LEAKAGE TEST. The Converter Leakage Test is performed with the converter pressurized with gaseous oxygen to 95 psig. Locate the indicated psig for the actual 95 psig on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

Performance Test Sheet
TYPE GCU-24/A LIQUID OXYGEN CONVERTER ASSEMBLY
(ESSEX CRYOGENICS P/N 10C-0016-10A)

DATE: ____________ CONVERTER SERIAL NO: ____________ TEST STAND SERIAL NO: ____________

OPERATOR: ____________ CDI: ____________ TARE WEIGHT: ____________

1. CONVERTER PURGE (PURGE 30 MINUTES AT 200°F (93°C) TO 250°F (121°C) AND AT 120 PSIG).

2. INSULATION RESISTANCE TEST (EMPTY).

CONNECTION	MINIMUM ALLOWABLE MEGOHMS	READING
A TO B	2.0	
A TO GROUND	1.0	
B TO GROUND	1.0	

3. CAPACITANCE TEST (EMPTY) READING SHALL BE 121.5 TO 125.5 MICROMICROFARADS (UUF) ____________

4. RELIEF VALVE TEST

VENT FLOW						LEAKAGE					
INLET PRESS (PSIG)			FLOW			INLET PRESS (PSIG)			FLOW		
ACTUAL	INDICATED	PG-1 READING	ACTUAL (LPM)	INDICATED (INH_2O)	PG-2 READING	ACTUAL	INDICATED	PG-1 READING	ACTUAL (LPM)	INDICATED (INH_2O)	PG-2 READING
100			100			95			0.01		
120											

5. CONVERTER LEAKAGE TEST

95 PSIG ACTUAL = ____________ PSIG INDICATED, WITH INDICATED PSIG APPLIED THERE SHALL BE NO LEAKAGE FROM THE PRESSURE CONTROL VALVE, BUILDUP COIL, TUBING AND FITTINGS.

6. FILL AND BUILDUP TIME TEST

A. FILL TIME (MAXIMUM TIME ALLOWED IS 10 MINUTES) ____________

B. BUILDUP TIME (MAXIMUM TIME TO BUILDUP TO 55 TO 90 PSIG IS 5 MINUTES) PSIG ACTUAL = ______ PSIG INDICATED TIME REQUIRED FOR BUILUP ________ MINUTES.

7. CAPACITANCE TEST (FULL)

TOTAL CONVERTER WEIGHT	
CONVERTER TARE WEIGHT	
LOX WEIGHT (W)	
2.33 X W + 124.7 = C (MAX)	
2.25 X W + 122.3 = C (MIN)	
READING	
C = CAPACITANCE IN UUF	W = WEIGHT OF LOX IN POUNDS

Figure 5-7. Converter Performance Test Sheet (Sheet 1 of 2)

8. FLOW TEST (120 LPM WHILE MAINTAINING 55 TO 90 PSIG WORKING PRESSURE)

WORKING PRESS. (PSIG)		FLOW (LPM)		PG-2 READING
ACTUAL	PG-1 INDICATED	ACTUAL	INDICATED	
55		120		
90				

9. EVAPORATION LOSS TEST (BUILDUP AND SUPPLY MODE) MAXIMUM ALLOWABLE LOSS OF LOX IN 24 HOURS IS 3.0 LBS.

NOTE: LOX IN CONVERTER MUST BE STABILIZED FOR 1 HOUR PRIOR TO BEGINNING TEST. DO NOT AGITATE CONVERTER DURING 24 HOUR PERIOD.

A. START TIME ____________________ START WEIGHT ____________________

B. FINISH TIME ____________________ FINISH WEIGHT ____________________

10. EVAPORATION LOSS TEST (VENTED MODE)
MAXIMUM ALLOWABLE LOSS OF LOX IN 24 HOURS IS 5.0 LBS. (PERFORMED ONLY IF CONVERTER FAILS EVAPORATION LOSS TEST IN BUILDUP AND SUPPLY MODE)

A. START TIME ____________________ START WEIGHT ____________________

B. FINISH TIME ____________________ FINISH WEIGHT ____________________

11. CONVERTER CHARGE (OXYGEN)

PRESSURE (PSIG)		
ACTUAL	INDICATED	READING
25		
30		

Figure 5-7. Converter Performance Test Sheet (Sheet 2 of 2)

5-22. FILL AND BUILDUP TIME TEST. The time required to fill the converter (10 liters) shall not exceed 10 minutes at a filling pressure of 30 psig.

5-23. The time required for the filled converter to build up a working pressure of 55 to 90 psig shall not exceed 5 minutes from time the servicing trailer filler valve is disconnected from converter. Locate indicated psig for the actual psig pressure on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

5-24. FLOW TEST. The converter shall be capable of delivering gaseous oxygen at the rate of 120 lpm while maintaining pressure of 55 to 90 psig. Make the following entries on the Performance Test Sheet:

1. Locate the indicated inH_2O for the actual flow of 120 lpm on correction card number 4. Enter indicated inH_2O in space provided on Performance Test Sheet.

2. Locate the indicated psig for actual pressures of 55 and 90 psig on correction card number 2. Enter actual psig in spaces provided on Performance Test Sheet.

5-25. CONVERTER CHARGE. Upon completing the Bench Test, the converter shall be emptied of LOX and pressurized with gaseous oxygen 25 to 30 psig. This prevents moisture from entering the converter during shipment/storage. Locate indicated psig for the actual pressures of 25 and 30 psig on correction card number 2. Enter indicated psig in spaces provided on Performance Test Sheet.

Section 5-4. Maintenance

5-26. GENERAL.

5-27. This section contains the procedural steps for inspecting, testing, troubleshooting, disassembly, cleaning, repair, assembly, and adjusting of the GCU-24/A Liquid Oxygen Converter Assembly Type (P/N 10C-0016-16).

NOTE

Upon completion of any maintenance action (e.g., inspection, repair, modification, etc), be sure to complete the required Maintenance Data Collection System forms.

5-28. EMERGENCY PRESSURE RELIEF PROCEDURES. When filling the converter, or at any time, if any of the following situations are encountered: Heavy frosting, icing, or excessive pressure buildup (in excess of 130 psig), perform the following immediately.

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Fixture, Test, Valve, Gage/Relief, Pressure	Fabricate IAW figure 5-9

Support Equipment Required (Cont)

Quantity	Description	Reference Number
1	Line, Drain, Converter, LOX	Fabricate IAW figure 5-11
1	Line, Drain, Port, Vent	Fabricate IAW figure 5-10

WARNING

LOX in a non-vented container will build to 12,000 psig. Converters, however, will explode at approximately 1,200 psig.

Do not attempt to relieve pressure in LOX converters that indicate critical overpressurization (figure 5-8). For these converters, comply with procedures as prescribed in the individual station/ships emergency procedures bill.

1. Attach pressure gage/relief valve test fixture (figure 5-9) to supply quick-disconnect coupling (17).

2. Attach vent port drain line (figure 5-10) to converter port coupling (45). Ensure vent port drain aces away from operator.

3. Ensure adapter (P/N 59A120-D5-46) backed out counterclockwise.

WARNING

When performing step 4, if excessive pressure does not relieve through vent port drain line, immediately comply with procedures as prescribed in the individual station/ships emergency procedures bill.

4. Install adapter (P/N 59A120-D5-46) to the fill port of fill, buildup, and vent valve (51) and relieve pressure from the converter by turning the knurl knob of the adapter (P/N 59A120-D5-46) clockwise four full turns (this places the converter in the vented mode).

5. Observe the pressure gage/relief valve test until 70 psig is indicated.

6. Remove pressure gage/relief valve test and adapter (P/N 59A120-D5-46).

WARNING

When performing step 7, if LOX fails to drain from the converter, disconnect LOX converter drain line, attach adapter (P/N 59A120-D5-46) to fill, buildup, and vent valve (51) and turn knurl knob clockwise 4 full turns. (Organizational Level transport defective converter to AIMD immediately.)

7. Immediately place converter in a LOX drain pan, attach LOX converter drain line (figure 5-11) to supply quick-disconnect coupling (17) and drain LOX from the converter.

8. Organizational Level forward the defective LOX converter to AIMD for bench test.

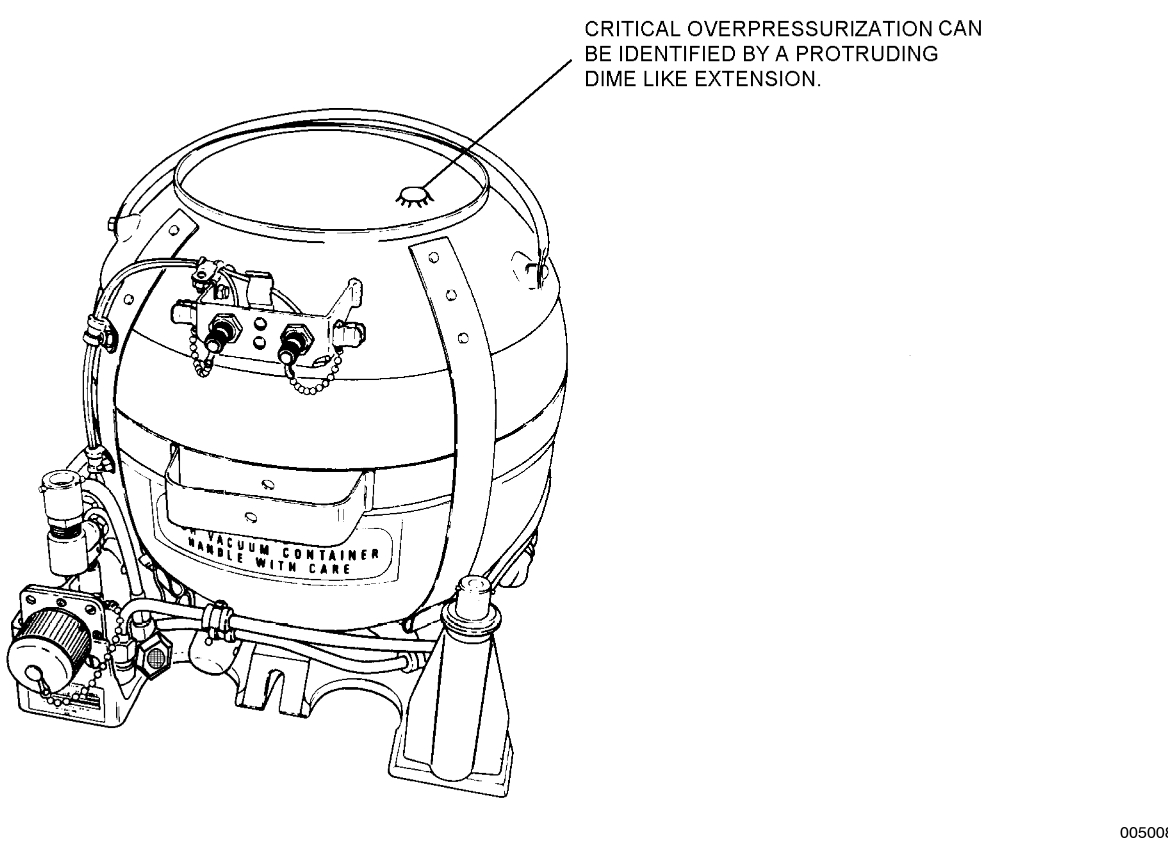
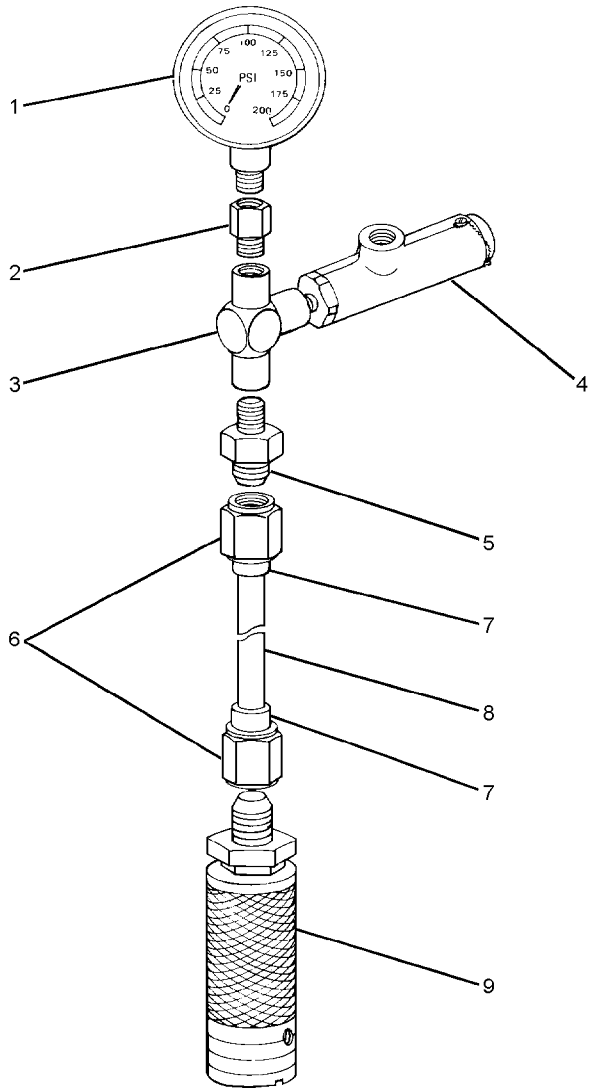


Figure 5-8. Critically Overpressurized Essex Lox Converter P/N 10C-0016-16

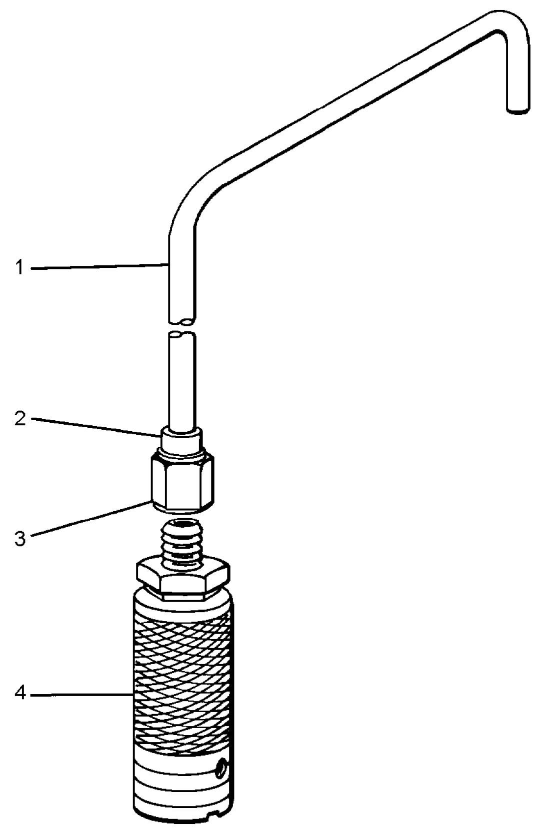


ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY INSTRUCTIONS
1	200 PSIG Oxygen Gage	P/N 100204-18 (CAGE 42527) NIIN 00-961-1990	Anti-seize tape required (Note 1)
2	1/4 to 1/8 in. Reducer, Pipe	P/N 3200X4X2 (CAGE 79470)	Anti-seize tape required
3	Pipe Tee	AN917-1	—
4	Relief Valve	P/N 20C-0005-20 (CAGE 19062) MIL-V-9050D P/N 20C-0050-2	Adjust to relieve at 135 ± 5 psig and flow a minimum of 100 lpm. (Note 1) Anti-seize tape required
5	Male Connector	AN816-5D	Anti-seize tape required
6	Tubenut	AN818-5	2 required
7	Tube Sleeve	MS20819-5	2 required
8	Flared Aluminum 6061-T6 Tube (5/16″ O.D. Dia)	—	Cut length 2 1/2 to 3 1/2 in.
9	Supply Quick-disconnect Coupling	MS22608-7 P/N 199000-1 (CAGE 83533)	—

Notes: 1. The Pressure Gage/Relief Valve Test Fixture shall be forwarded to AIMD for relief valve setting, flow test, and leakage test (same as converter relief valve test only higher setting). The 200 PSI Oxygen Gage shall be calibrated in accordance with the metrology and calibration (METCAL) program.

005009

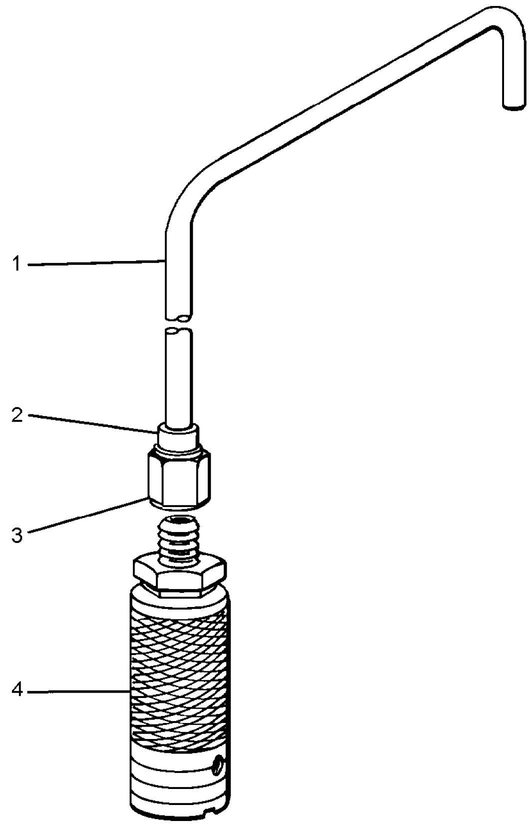
Figure 5-9. Pressure Gage/Relief Valve Test Fixture



ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY INSTRUCTIONS
1	Flared Aluminum 6061-T6 Tube (1/2 O.D. Dia)	—	Cut to 14-inches; bend as shown above
2	Tube Sleeve Coupling	MS20819-8	—
3	Tubenut	AN818-8	—
4	Half Coupling Quick-disconnect	2560000-1 (CAGE 83533)	—

005010

Figure 5-10. Vent Port Drain Line



ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY INSTRUCTIONS
1	Flared Aluminum 6061-T6 Tube (5/16″ O.D. Dia)	—	Cut to 14-inches length; bend as desired
2	Tube Sleeve	MS20819-8	—
3	Tubenut	AN818-5	—
4	Quick-disconnect Coupling	MS22068-7 P/N 199000-1 (CAGE 83533)	—

005011

Figure 5-11. LOX Converter Drain Line

5-29. INSPECTION.

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical over-pressurization, immediately comply with the emergency pressure relief procedures given in paragraph 5-28 at the beginning of this section.

5-30. ACCEPTANCE/TURNAROUND/DAILY/PREFLIGHT/POSTFLIGHT AND TRANSFER INSPECTIONS. The Acceptance/Turnaround/Daily/Preflight/Postflight and Transfer Inspections consist of a Visual Inspection followed by a Functional Test. These inspections and tests shall be performed in conjunction with the aircraft inspection requirements for the aircraft in which the converter is installed. Refer to table 5-2 for troubleshooting assistance.

NOTE

Fill the converter in accordance with paragraph 5-49; ensuring strict compliance with all steps, especially steps 5 and 6.

5-31. Any liquid oxygen converter which does not pass the Visual Inspection or Functional Test shall be removed from the aircraft, drained immediately, and replaced by a Ready For Issue (RFI) liquid oxygen converter. To drain the liquid oxygen converter, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Line, Drain, Converter, LOX	Fabricate IAW figure 5-11

NOTE

If no LOX converter drain line is available, fabricate one in accordance with figure 5-11.

1. Place converter in LOX drain pan in an area free from dirt and hydrocarbons.

WARNING

Ensure that draining LOX is directed away from all personnel.

2. Attach drain line (figure 5-11) to converter supply quick-disconnect coupling, which will immediately begin draining converter.

3. Contact Maintenance Control for action to be taken.

5-32. Visual Inspection. Visually inspect the converter assembly and surrounding area for the following:

WARNING

When working with oxygen, make certain that clothing, tubing fittings, and equipment are free of oil, grease, fuel, hydraulic fluid, or any combustible liquid. Fire or explosion may result when even slight traces of combustible material come in contact with oxygen under pressure.

1. Freedom from dirt and hydrocarbons.

2. Correct installation and positioning of all components.

3. Presence and condition of safety wire and Glyptal dots on relief valve and pressure closing valve.

4. Legibility of all markings.

5. Cracks, dents, or other damage to tubing, valves, and electrical connections.

6. Corrosion on converter assembly and surrounding areas.

7. Obstructions in aircraft overboard vent line.

8. Security of supply, vent and electrical quick disconnects.

9. Excessive frosting and/or continuous venting of converter assembly.

Table 5-2. Troubleshooting (Acceptance/Turnaround/Daily/Preflight/Postflight and Transfer Inspections)

Trouble	Probable Cause	Remedy
Converter will not fill.	Ice in filler valve or filler obstructs LOX flow.	Thaw filler valve or filler line.
Converter does not fill in required time.	Filler line not properly purged prior to filling.	Purge and cool filler line.
	Converter not sub-cooled before filling.	Lower pressure in servicing trailer and sub-cool converter.
	Filling pressure too low.	Set fill pressure in accordance with servicing trailer operating instructions.
	Defective converter.	Replace converter with RFI converter.
Frost collects on entire outer jacket of converter.	Heat loss due to annular space leakage.	Replace converter with RFI converter.
Converter will fill only partially (gas only emitted from vent).	Converter not sub-cooled prior to filling.	Lower pressure in servicing trailer and sub-cool converter.
System will not build up.	Combination valve defective or partially open.	Replace converter, or thaw valve.
	Pressure relief valve open.	Replace converter with RFI converter.
Oxygen supply consumed too quickly.	Converter not completely filled during filling operation.	Refill converter.
	System Leakage.	Locate and repair leaks.
	Combination valve partially open, venting gas.	Replace converter with RFI converter.
Filler line cannot be disconnected from filler valve.	Filler nozzle frozen to filler valve.	Thaw nozzle.
Low, or no system pressure.	System leakage.	Locate and repair leaks.
	Pressure closing valve out of adjustment.	Replace converter with RFI converter.
Quantity gage indicates empty.	System empty; defective probes or gage.	Refill converter; replace converter or gage.
LOX system contaminated.	Undesirable odors, or moisture.	Purge system.

10. Ensure that date on converter bench test decal is current (within last 231 days).

5-33. Functional Test. To functionally test the converter assembly and aircraft oxygen system, proceed as follows:

NOTE

The Functional Test should also be performed whenever a component of the aircraft oxygen system is removed/replaced.

1. Ensure that all circuit breakers associated with the LOX quantity indicating system are set.

NOTE

External electrical power must be applied to the aircraft to perform steps 2 and 3.

Refer to applicable aircraft Handbook of Maintenance Instructions (HMI) to determine at what quantity (indicated on quantity gage) that low warning light should illuminate.

2. Depress oxygen test switch. Check quantity gage and low warning light for proper operation.

3. Release test switch. Ensure that gage pointer returns to position registered on gage before depressing. When test is completed, disconnect electrical power from aircraft.

4. Ensure that oxygen shut-off valve is in OFF position.

5. Attach an oxygen mask, regulator, and regulator-to-seat kit hose assembly to oxygen supply connection in aircraft.

6. Turn oxygen shut-off valve to ON position. There should be a flow of oxygen through the mask.

NOTE

Resistance during exhalation is due to the positive pressure feature of the regulator.

7. Place mask against face and breathe. There should be a slight resistance during exhalation.

8. Upon completion of Functional Test, turn oxygen shutoff valve to OFF. Disconnect regulator-to-seat kit hose from aircraft supply connection.

5-34. If discrepancies are found or suspected, Maintenance Control shall be notified.

5-35. Components of the aircraft oxygen system which do not pass inspection and cannot be repaired in the aircraft shall be removed and replaced by Ready For Issue (RFI) components. Forward defective components to AIMD for Bench Test.

5-36. CALENDAR INSPECTION. The Calendar Inspection shall be performed on all liquid oxygen converters that incorporate a quick-disconnect mounting plate prior to placing in service, and at intervals not exceeding 231 days thereafter. This interval applies to all converters: aircraft-installed, shop spares, and those maintained in a servicing pool.

5-37. The Calendar Inspection consists of a Visual Inspection followed by a Bench Test. All work shall be performed in a clean, dust-free and oil-free area. Converter assemblies found to be damaged or out of adjustment shall be repaired by replacing or adjusting the discrepant part or parts. After repair, repeat the Bench Test.

NOTE

Liquid oxygen converters new from supply, manufacture, or from NARF overhaul do not require the bench test decal. The Bench Test decal shall be placed on the converter by the local AIMD when the converter is placed in service and after each Bench Test.

5-38. Visual Inspection. Inspect the converter assembly in accordance with table 5-3.

5-39. Liquid oxygen converters failing the Visual Inspection or Bench Test (paragraph 5-40) shall be repaired, if specific repair is authorized. SM&R codes define repairable components and levels of maintenance authorized to perform repairs. Further explanation is found in Naval Aviation Maintenance Program Manual, OPNAVINST 4790.2 Series.

Table 5-3. Visual Inspection of Type GCU-24/A Liquid Oxygen Converter, P/N 10C-0016-16

Part Nomenclature	Index Number	Inspect For	Remedy
Note: Index numbers in this table refer to figure 5-18.			
Identification and performance plates.	-1 and -3	Legibility, condition and security.	Secure in place, or replace.
Warning and bench test decals.	-5	Presence and condition.	Replace or apply as required.
Handle.	-6	Bends and cracks.	Replace.
Tubing assemblies.	-11, -31, -38, -40, -43, and -84	Cracks, dents, nicks, scratches, twists and proper clearance. Damaged connectors and tube nuts.	Replace damaged tubing assemblies and connectors. Tubing may be slightly bent to maintain a minimum 1/16-inch clearance between other converter components.
Elbows and nipples.	All	Cracks, dents and scratches.	Replace.
Male quick-disconnects.	-17 and -45	Visible damage.	Replace.
Supply manifold assembly.	-18	Visible damage.	Replace.
Fill buildup and vent valve.	-51	Cracks, damaged threads and other visible damage.	Replace/perform bench test.
Clamps.	All	Security and condition.	Tighten or replace.
Pressure relief and pressure closing valve.	-57 and -58	Cracks or other visible damage. Presence and condition of Glyptal dots. Presence and condition of safety-wire.	Perform bench test.
Mounting strap, mounting cradle and mounting base assembly.	-87, -78, and -89	Cracks, broken welds, chipped paint or other visible damage.	Replace. Restore finish by painting (paragraph 5-62).
Sphere assembly.	-88	Evidence of over pressurization (dime like protrusion) excessive dents, chipped paint or other damage.	Refer to paragraph 5-62 for size of acceptable dents. Restore finish by painting (paragraph 5-62).
Converter assembly.	No Index	Freedom from dirt, hydrocarbons and corrosion.	Clean (paragraph 5-56) and/or refinish (paragraph 5-62).
Burst Disc.	-37	Cracks, dents, ruptures, or other damage.	Replace (paragraph 5-71).

5-40. BENCH TEST.

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical over-pressurization, immediately comply with the emergency pressure relief procedures given in paragraph 5-28 at the beginning of this section.

NOTE

Some in service liquid oxygen converter test stands that bear part numbers other than those mentioned in paragraph 5-41 or covered in appropriate ground support equipment manual still exist. Use of these test stands is authorized provided they are capable of monitoring converter performance as specified in the Bench Test.

5-41. The Bench Test shall be performed using Liquid Oxygen Converter Test Stand P/Ns 59A120, 31TB1995-1, 1455AS100-1, or 31TB1995-4. Refer to appropriate ground support equipment manual for identification of test stand controls and indicators referenced in Bench Test procedures. Do not attempt to perform any Bench Test without first becoming thoroughly familiar with the test stand (refer to appropriate ground support equipment manual). Utilize Performance Test Sheet (figure 5-7) when performing Bench Test.

WARNING

When working with oxygen, make certain that clothing, tubing fittings, and equipment are free of oil, grease, fuel, hydraulic fluid, or any combustible material. Fire or explosion may result when even slight traces of combustible material come in contact with oxygen under pressure.

Prior to use, inspect leak detection compound. Compound which is not clear and free from suspended material/sediment is considered contaminated and shall be disposed of. Compound exhibiting peculiar odors such as acetone or alcohol is considered contaminated and shall be disposed of.

When using leak detection compound, carefully avoid getting it on Probe Wire connections as moisture will cause incorrect capacitance/insulation reading.

NOTE

Tests are arranged so they proceed from one test to the next with a minimum of flow changes. Troubleshooting tables are provided following each test.

5-42. TARE WEIGHT. To find the tare weight of the complete converter assembly, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

NOTE

Tare weight is the weight of the complete converter assembly less the weight of the LOX.

1. Ensure all LOX has been removed from the converter.

2. Place converter assembly on scale of at least 50-lb capacity. Record weight in space provided on Performance Test Sheet.

5-43. CONVERTER ASSEMBLY PURGE. To purge the converter assembly, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Nitrogen, Oil-free, Water Pumped, Type I, Class I, Grade B	Fed Spec BB-N-411 NIIN 00-985-7275

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Coupling, Quick-disconnect, Half	256000-1 MS22068-8 (CAGE 83533)
1	Expander, Thread, Screw, Bushing	AN894-8-4
1	Purging Unit, Gas/LOX, Model A/M26M-3	3447AS100-1

WARNING

Use only oil-free nitrogen, Type I, Class 1, Grade B (Fed Spec BB-N-411) for purging LOX converters.

Purging unit model A/M26M-3 has two specially designed 3500 psig nitrogen cylinders. Do not substitute these cylinders with other nitrogen cylinders such as NAN cart cylinders.

While operating purging unit A/M26M-3, protective gloves must be worn by operator. Discharge fittings and hoses can reach temperatures that will cause burns if grasped with bare hands.

NOTE

Personnel operating purging unit model A/M26M-3 should be thoroughly familiar with all valves and controls prior to operating. Refer to appropriate support equipment manual. Personnel operating purging unit model A/M26M-3 shall be licensed in accordance with OPNAVINST 4790.2 Series.

Liquid oxygen converters shall be emptied of all LOX and allowed to warm to ambient temperature prior to purging.

Index numbers in parentheses for LOX converter assembly refer to figure 5-18.

Index numbers for purging unit model A/M26M-3 refer to figure 5-12.

1. Remove two supply lines (14) from purge unit cabinet. Connect one end of each supply line (14) to nitrogen supply cylinders and the other ends to the supply inlet connections (22) of purge unit.

2. Remove insulated hose (15) from purge unit cabinet. Connect quick-disconnect (18) of insulated hose (15) to system (A) quick-disconnect (19) of purge unit.

3. Screw boss to pipe fitting (AN894-8-4) onto quick-disconnect coupling (P/N 256000-1) and attach to B-nut (23) of insulated hose (15).

4. Turn purge unit 3-way valve (20) to system (A) position.

5. Ensure power switch (5) is OFF.

6. Remove power cable (17) from purge unit cabinet and plug into 110 volt outlet.

7. Open both nitrogen supply cylinder valves.

8. Open hand shutoff valves (1) and (3). High pressure gage (4) will indicate nitrogen supply cylinder pressure.

9. Connect quick-disconnect coupling (P/N 256000-1), attached to insulated hose (15), to LOX converter vent port of fill, build up, and vent valve (43).

10. Attach adapter (P/N 59A120-D5-46) to fill port of LOX converter fill, build up, and vent valve (43). Turn knurl knob of adapter (P/N 59A120-D5-46) clockwise until it seats, then back off counterclockwise two (2) full turns. This will place the fill, build up, and vent valve half way between the fill/vent and build up/vent modes.

11. Attach LOX converter drain lines (figure 5-11) to LOX converter supply quick-disconnect coupling (16).

12. Turn power switch (5) to ON position. Power on light (6) should illuminate.

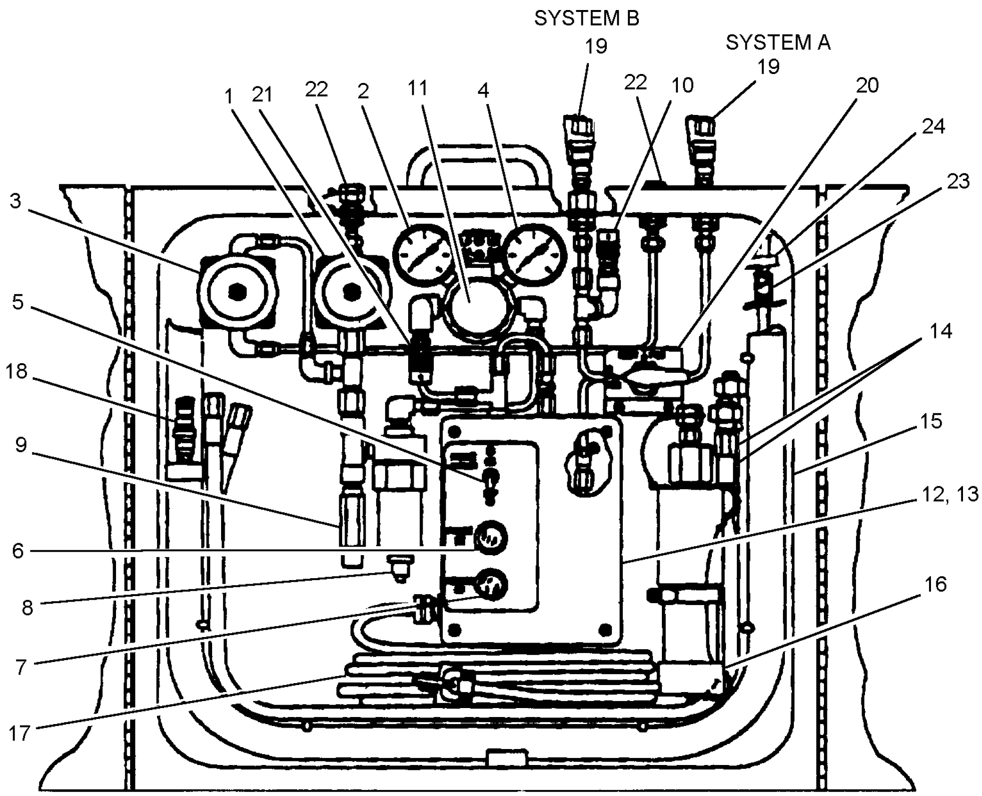
13. Turn pressure regulator (11) clockwise until 120 psig is indicated on low pressure gage (2).

NOTE

For LOX converters that show indications of internal probe short, it may be necessary to purge the converter for a longer period of time when performing step 14.

14. Observe heater on light (7). When light cycles from on to off, purge the converter for 30 minutes, with a minimum discharge temperature of 90°F.

15. When purging is completed, turn purging unit power switch (5) to off.



Description	Function
1. Hand Shutoff Valve	Controls Supply Gas Flow
2. Low Pressure Gage	Indicates Delivery Gas Pressure (0-200 PSIG)
3. Hand Shutoff Valve	Controls Supply Gas Flow
4. High Pressure Gage	Indicates Supply Gas Pressure (0-4000 PSIG)
5. Power Switch	Master On/Off Switch/Circuit Breaker
6. Power On Light	Indicates Master Switch is On and Set is Operational
7. Heater On Light	Indicates Operation of Heater
8. Priority Valve	Stops Gas Flow When Supply Gas Pressure Falls Below 200 PSIG
9. Relief Valve	Relieves Supply Pressure Exceeding 3750 PSIG
10. Low Pressure Relief Valve	Relieves Service Line Supply Pressure Exceeding 705 PSIG
11. Pressure Regulator Assembly	Regulates Pressure to 0-200 PSIG
12. Temperature Control Switch (Under Plate)	Cycles Off and On to Control Exit Gas
13. High Temperature Shutdown (Under Plate)	Shuts Off Heater when Heater Block Temperature Reaches 285°F
14. Supply Line	Connects Supply Cylinders to Housing Assembly
15. Insulated Hose Assembly	Connects Housing Assembly
16. Filler Valve	Connects Insulated Hose Assembly to Converter
17. Power Cable	Connects Unit to Electrical Power
18. Quick Disconnect	Connects Insulated Hose to 19 System A or B
19. Quick Disconnect	Connection for Insulated Hose to 19 System A or B
20. 3-Way Valve	Selects A or B Outlet Ports
21. High Pressure Relief Valve	Relieves Service Line Supply Pressure Exceeding 1355 PSIG
22. Supply Pressure Inlet	Connects Supply Line 14 to Purge Unit
23. B-Nut	Connects Insulated Hose to Filler Valve 16 or Adapter (Not Shown)
24. Adapter	Connects Insulated Hose to P-3 Aircraft Filler Port

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Figure 5-12. A/M26M-3 Purging Unit

16. Close nitrogen supply cylinder valves.

17. Observe low pressure gage (2) and high pressure gage (4) until they indicate 0 psig. Back out counterclockwise on pressure regulator (11).

18. Close hand shutoff valves (1) and (3).

19. Disconnect insulated hose (15) from LOX converter vent port fitting of fill, build up, and vent valve (43) and purging unit system (A) quick disconnect (19).

20. Remove drain lines (figure 5-11) from LOX converter supply quick disconnect coupling (16).

21. Remove adapter (P/N 59A120-D5-46) from filler port of fill, build up, and vent valve (43).

22. Stow all lines and accessories and secure from purging.

5-44. INSULATION RESISTANCE TEST (EMPTY). To perform the Insulation Resistance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Prior to proceeding, it should be noted that the minimum acceptable megohm readings have been changed as follows. Between A to B, 2.0 megohms; between A to ground and B to ground the reading shall not be less than 1.0 megohm. These readings are acceptable as long as the converter passes the Capacitance Test (Empty) and Capacitance Test (FULL).

1. Secure empty converter in rack provided on test stand counter top.

2. Using test stand cable assembly (P/N 59A120-B5-32-2) (figure 5-13), connect upper terminals of high and low capacitance cable assemblies (76 and 77, figure 5-18) to terminals A and B of liquid oxygen quantity gage capetown type tester.

3. Turn power switch ON and allow tester to warm up 10 minutes prior to proceeding.

4. Turn MEGOHMMETER RANGE SELECTOR to X-1 position.

5. Turn FUNCTION SELECTOR knob to A to B position. Record reading in space provided on Performance Test Sheet. Reading should not be less than 2.0 megohms.

6. Turn FUNCTION SELECTOR knob to A to GROUND and B to GROUND positions, respectively. Record readings in spaces provided on Performance Test Sheet. Readings shall not be less than 1.0 megohm in either position.

NOTE

If insulation resistance readings are acceptable, proceed to step 11.

7. If insulation resistance readings are less than allowed, connect cable (figure 5-14) to lower probe terminals, and repeat steps 5 and 6.

8. If readings are acceptable, replace low or high capacitance cable assemblies (76 and 77, figure 5-18) as required. Repeat steps 5 and 6. If readings are acceptable, proceed to step 11.

9. If readings continue to be less than acceptable, moisture may still be present in sphere assembly. Purge converter in accordance with paragraph 5-43 and repeat test.

10. Converter assemblies that fail the Insulation Resistance Test and cannot be corrected by replacing low/high capacitance cable assemblies or by purging, shall be forwarded to the next higher maintenance repair facility.

11. Leave all connections unchanged.

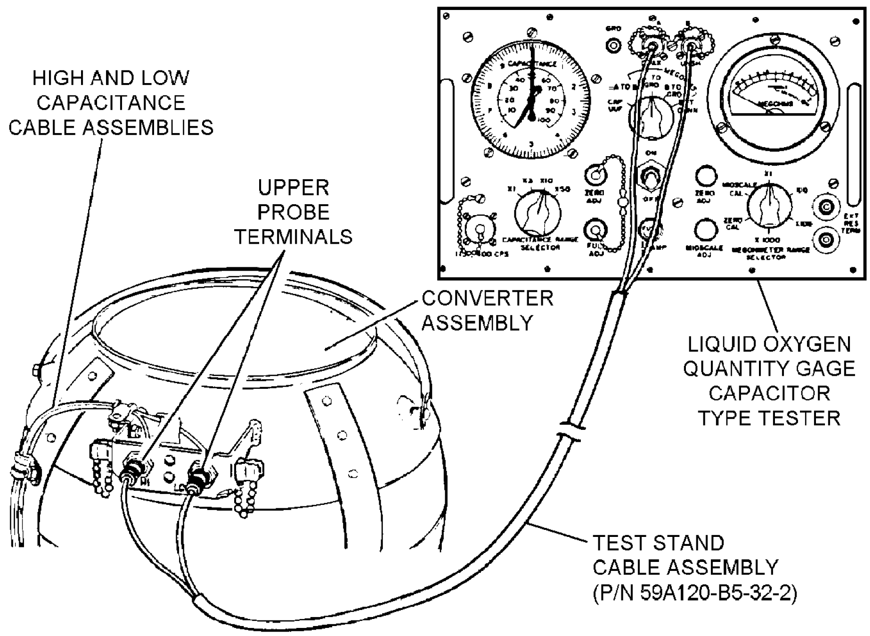


Figure 5-13. Capacitance/Insulation Resistance Test Hook-up Upper Probe Terminals

5-45. CAPACITANCE TEST (EMPTY). To perform the Capacitance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Turn CAPACITANCE RANGE SELECTOR knob to X-10 position.

2. Turn FUNCTION SELECTOR knob to CAPACITANCE (UUF) position.

3. Record reading in space provided on Performance Test Sheet. Reading shall be 121.5 to 125.5 micromicrofarad (µµF). If reading is acceptable, proceed to step 7.

4. If reading is not within limits, connect test stand cable assembly (figure 5-14) to lower probe terminals of high and low capacitance cable assemblies, and repeat steps 1 through 3.

5. If reading is acceptable in step 4, capacitance cables are defective. Replace high and low capacitance cable assemblies (76 and 77, figure 5-18). Connect test stand cable assembly to upper probe terminals and repeat steps 1 through 3.

6. If reading is still not within limits in step 4, moisture may still be present in sphere. Purge converter in accordance with paragraph 5-43, and repeat Capacitance Test.

NOTE

Converters that fail the Capacitance Test and cannot be corrected by replacing capacitance cables or purging shall be forwarded to the next higher maintenance repair facility.

7. Secure power to tester and disconnect test stand assembly from converter and test stand.

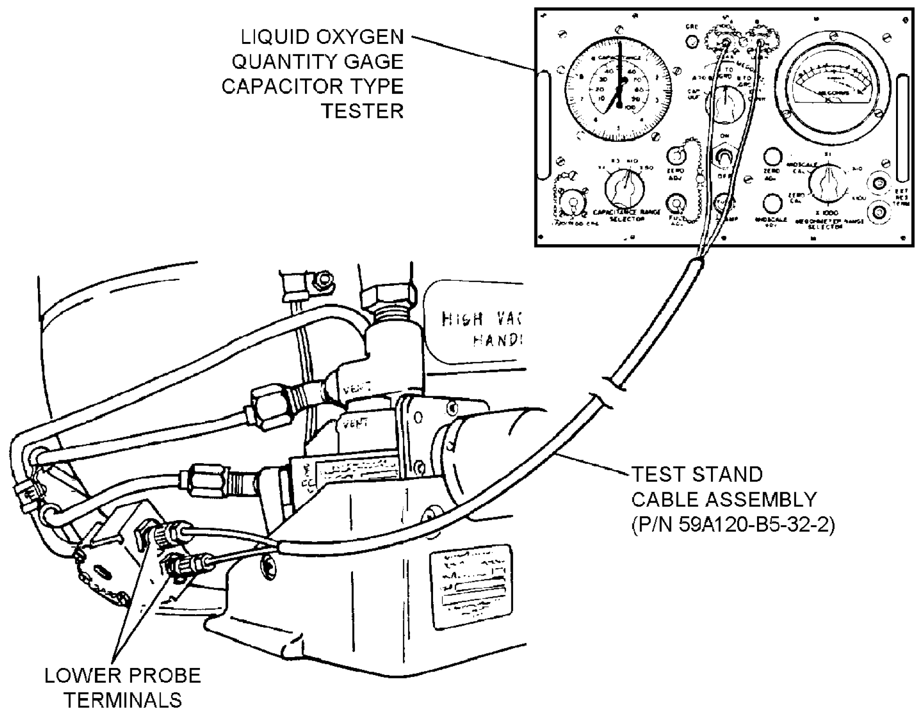


Figure 5-14. Capacitance/Insulation Resistance Test Hook-up Lower Probe Terminals

5-46. RELIEF VALVE TEST. To perform the Relief Valve Test, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Glyptal	1201B (CAGE 24452)
As Required	Lock wire	MS20995C20

Support Equipment Required

Quantity	Description	Reference Number
1	Hose Assembly, Stand, Test	59A120-B5-14
1	Hose Assembly, Stand, Test	59A120-B5-52
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Index numbers in parentheses refer to figure 5-18.

1. Remove cap and chain (16) from test port (15).

2. Using test stand hose assembly (P/N 59A120-B5-14), connect test stand BELL JAR BOTTOM COUPLING (C-1) to test port fitting (15).

3. Using test stand hose assembly (P/N 59A120-B5-52), connect converter quick-disconnect coupling (45) to test stand FLOWMETER connection (NIP-4).

4. Turn FLOWMETER SELECTOR valve (V-1) to the 0-150 lpm position. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

CAUTION

Open OXYGEN SUPPLY valve and observe TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2) when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

5. Slowly open OXYGEN SUPPLY valve (V-6) until 100 lpm flow is indicated on FLOWMETER INDICATOR gage (PG-2).

6. With 100 lpm indicated on FLOWMETER INDICATOR gage (PG-2), reading on TEST PRESSURE gage (PG-1) shall be 100 to 120 psig. Record reading from TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2) on Performance Test Sheet.

7. Using OXYGEN SUPPLY valve (V-6), and SYSTEM BLEED valve (V-5), reduce pressure applied to converter to 95 psig as indicated on TEST PRESSURE gage (PG-1).

8. Disconnect test stand hose (P/N 59A120-B5-52) from FLOWMETER connection (NIP-4).

CAUTION

When attaching test stand hose (P/N 59A120-B5-52) to FLOWMETER connection (NIP-1), attach slowly while observing FLOWMETER INDICATOR gage (PG-2). Excessive relief valve leakage could damage FLOWMETER INDICATOR gage (PG-2).

9. Turn FLOWMETER SELECTOR valve (V-1) to the 0.0-0.25 lpm position and slowly connect test stand hose (P/N 59A120-B5-52) to FLOWMETER connection (NIP-1).

10. While maintaining 95 psig to the converter with OXYGEN SUPPLY valve (V-6), check for leakage indicated on FLOWMETER INDICATOR gage (PG-2). Maximum allowable leakage is 0.01 lpm. Record reading on Performance Test Sheet.

11. If leakage is excessive, or if relief valve fails to vent at required flow and pressure, locate probable cause using troubleshooting chart, table 5-4.

12. Apply Glyptal dots to safety wired setscrews.

13. Close OXYGEN SUPPLY valve (V-6). Bleed test stand using SYSTEM Bleed valve (V-5). Close TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

14. Disconnect test stand hose assembly (P/N 59A120-B5-14) from test stand.

15. Install cap and chain (16) onto test port fitting (15).

5-47. CONVERTER LEAKAGE TEST. To perform the Converter Leakage Test, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Coupling, Quick-disconnect (Female)	199000-1 MS22068-7
1	Hose Assembly, Stand, Test	59A120-B5-14
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Index numbers in parentheses refer to figure 5-18.

1. Connect quick-disconnect coupling (P/N 199000-1) to test stand hose assembly (P/N 59A120-B5-14).

2. Using hose assembly, connect test stand BELL JAR BOTTOM COUPLING (C-1), to converter supply quick-disconnect coupling (17).

3. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly when applying pressure converter. Damage to test stand gages could result from rapid surges in pressure.

4. Utilizing OXYGEN SUPPLY valve (V-6), apply 95 psig, as indicated on TEST PRESSURE gage (PG-1) to converter.

Table 5-4. Troubleshooting (Relief Valve Test)

Trouble	Probable Cause	Remedy
Relieving below 100 psig.	Relief valve out of adjustment.	Adjust relief valve (paragraphs 5-65, 67 and 68).
Relieving above 120 psig.	Relief valve out of adjustment.	Adjust relief valve (paragraphs 5-65, 67 and 68).
Relief valve fails to vent 100 lpm.	Relief valve out of adjustment.	Adjust relief valve (paragraphs 5-65, 67 and 68).
Leakage in excess of 0.01 lpm.	Relief valve out of adjustment.	Adjust relief valve (paragraphs 5-65, 67 and 68).
Relief valve cannot be adjusted to tolerances.	Defective parts.	Replace relief valve.

5. Maintain 95 psig and inspect for leakage at all connections using leak detection compound. There is no allowable leakage. If leakage is indicated, locate probable cause using troubleshooting chart, table 5-5.

6. Close OXYGEN SUPPLY valve (V-6). Bleed test stand using SYSTEM BLEED valve (V-5). Close TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

7. Disconnect hose assembly installed in step 2 from converter supply quick-disconnect coupling (17) and apply leak detection compound to converter supply quick-disconnect coupling (17).

8. Using adapter, bleed pressure from the converter.

9. Remove converter assembly from test stand.

5-48. FILL AND BUILDUP TIME TEST. To perform the Fill and Buildup Time Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Fixture, Test, Valve, Gage/Relief, Pressure	Fabricate IAW figure 5-9
1	Line, Drain, Port, Vent	Fabricate IAW figure 5-10

WARNING

Because of the extreme low temperature of LOX, use extreme care at all times when handling LOX. Ensure prescribed protective clothing is worn and all safety precautions are observed (Chapter 3).

Ensure venting LOX is directed away from all personnel in the area.

NOTE

Personnel servicing LOX converters and operating LOX transfer equipment shall be qualified and licensed in accordance with OPNAVINST 4790.2 Series.

To perform this test, it will be necessary to take the converter to a LOX servicing area or use a LOX servicing trailer in the immediate area of the Oxygen Shop. Any other method is acceptable that meets requirements of the test and does not violate safety precautions outlined in Chapter 3.

1. Connect the converter to the servicing trailer.

NOTE

If servicing trailer being used is not the closed loop type, attach a vent port drain line (figure 5-10) to the vent port coupling (45). Ensure vent port drain line is attached to route venting LOX away from all personnel.

2. Note the time, and fill the converter following applicable instructions for specific ground support equipment servicing trailer being used.

Table 5-5. Troubleshooting (Converter Leakage Test)

Trouble	Probable Cause	Remedy
Any fitting connection leaking.	Loose connection.	Tighten connection.
Elbow or nipple fitting leaking.	Stripped threads, excessive burrs, deep scratches, inside or outside diameter out of round or loose.	Retighten or replace fitting(s).
Tubing leaking.	Dents, kinks, deep scratches, twisted tubing , improperly flared ends or damaged connectors.	Replace tubing.

3. When the converter is full, note the time. Time required to fill the converter shall not exceed 10 minutes. Record fill time in space provided on Performance Test Sheet.

4. Note the time, and disconnect and secure the servicing trailer and remove the vent port drain line if installed. Time noted is beginning of Fill and Buildup Time Test.

NOTE

The Test Pressure Gage Relief Valve Test fixture shall be forwarded to the Intermediate Maintenance activity every 6 months for pressure gage calibration and relief valve adjustment and leakage test.

5. Immediately after servicing, attach pressure gage/relief valve test fixture (figure 5-9) to converter supply quick-disconnect coupling (16) and observe for 5 minutes; the following actions should occur:

a. The converter should begin to build head pressure as indicated on the pressure gage/relief valve test fixture. Initially the converter will build a pressure that will cause the LOX converter relief valve to relieve (110 to 120 psig). This action may occur twice.

WARNING

When performing step 5b, if pressure fails to stabilize, drain the LOX converter and forward to Intermediate Level maintenance.

b. After step 5a occurs, pressure indication on the pressure gage/relief valve test fixture should stabilize at LOX converter pressure closing valve setting of 55 to 90 psig (a slight fluctuation of 2 to 3 psig on the pressure gage/relief valve test fixture will be present).

6. Disconnect pressure gage/relief valve test fixture from supply quick-disconnect coupling.

7. If converter fails to build head pressure, converter relief valve fails to relieve between 110 to 120 psig, or converter fails to stabilize between 55 to 90 psig, refer to troubleshooting chart, table 5-6.

5-49. CAPACITANCE TEST (FULL). To perform the Capacitance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

NOTE

This test requires simultaneous use of the 50-lb capacity scale and the quantity gage capacitance type tester incorporated in the test stand. Ensure that scale is positioned close enough to tester.

1. Place full converter on a scale of at least 50-lb capacity.

Table 5-6. Troubleshooting (LOX Converter After Servicing)

Trouble	Probable Cause	Remedy
Converter fails to build head pressure.	Converter fill, buildup, and vent valve failed to return to build-up and supply mode.	Foward converter to AIMD for purge or valve replacement and Bench Test. Drain converter by removing the tube assembly (index number 29, figure 5-15). Place converter upside down in drain pan and allow to drain by gravity flow process.
Converter relief valve fails to relieve between 110 to 120 psig.	Converter relief valve out of adjust ment or defective.	Forward converter to AIMD for relief valve adjustment or replacement and Bench Test.
Converter pressure continues to build and will not stabilize.	Converter pressure closing valve defective.	Forward converter to AIMD for pressure closing valve replacement and Bench Test.

2. Using test stand cable assembly (figure 5-13), connect upper terminal of converter high and low capacitance cable assemblies (76 and 77, figure 5-18) to terminals A and B of liquid oxygen quantity gage capacitance type tester.

3. Turn power ON and allow tester to warm up 10 minutes before proceeding.

4. Turn CAPACITANCE RANGE SELECTOR knob to 10X position.

5. Turn FUNCTION SELECTOR knob to CAPACITANCE (UUF) position.

6. Enter total weight of full converter in space provided on Performance Test Sheet.

7. Enter Tare Weight of converter in space provided on Performance Test Sheet.

NOTE

If the weight of the LOX in the converter is 24 lbs 4 oz, 24 lbs 8 oz, and etc.; the ounces must be converted to decimal.

Example

24 lb 4 oz = 24-4/16 lbs
24-4/16 lbs = 24.25 lbs

Enter 24.25 on the Performance Test Sheet.

8. Subtract Tare Weight of converter from total weight. Enter this figure on Performance Test Sheet. This is weight of LOX in converter.

9. Calculate the capacitance maximum (C-max) by multiplying the weight of the LOX (W) by 2.33, and adding 124.7 to the result (2.33(W) + 124.7 = C-max). Enter the result in the space provided on the Performance Test Sheet.

10. Calculate the capacitance minimum (C-min) by multiplying the weight of the LOX (W) by 2.25, and adding 122.3 to the result (2.25(W) + 122.3 = C-min). Enter the result in space provided on Performance Test Sheet.

11. Observe and record capacitance reading from test stand capacitance gage in space provided on Performance Test Sheet. Reading shall be between minimum and maximum established in steps 9 and 10.

12. If reading is not within limits, connect test stand cable assembly (figure 5-14) to lower probe terminals of high and low capacitance cable assemblies and repeat steps 4 through 11.

13. If the test is within limits, replace the cable assemblies (76 and 77, figure 5-18) and repeat steps 2 through 11.

14. If test is not within limits and converter has not been purged in previous tests, there must be moisture in the sphere. Purge converter in accordance with paragraph 5-43, refill with LOX, and repeat steps 1 through 11.

NOTE

If capacitance reading is still not within limits, the converter shall be forwarded to the next higher maintenance repair facility.

15. Secure tester and disconnect cable (figure 5-13) from converter and tester. If converter passes Capacitance Test, carefully remove converter from scale.

5-50. FLOW TEST. To perform the flow test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Hose Assembly, Stand, Test	59A120-B5-12
1	Hose Assembly, Stand, Test	59A120-B51
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Secure converter in rack provided on test stand counter top.

2. Using test stand hose assembly (P/N 59A120-B5-12), interconnect test stand FLOWMETER connection (NIP-4), to CONVERTER SUPPLY OUTLET connection (NIP-5).

3. Using test stand hose assembly (P/N 59A120-B51), connect test stand SUPPLY-TO-CONVERTER connection (NIP-6), to converter supply quick-disconnect coupling (17, figure 5-18).

4. Place test stand FLOWMETER SELECTOR valve (V-1), in 0-150 lpm position. Open TEST PRESSURE GAGE BUILD-UP AND FLOW valve (V-10).

NOTE

If TEST PRESSURE gage (PG-1), reads above 90 psig, attach fill vent adapter (P/N 59A120-D5-46) to the fill, buildup, and vent valve. Vent converter system pressure to 70 psig by turning knurled knob clockwise.

5. Open test stand CONVERTER SUPPLY FLOW CONTROL valve (V-9), to a flow of 120 lpm as indicated on FLOWMETER INDICATOR gage (PG-2). Allow flow to the converter for 5 minutes.

6. While maintaining a 120 lpm flow, the converter shall maintain pressure of 55 to 90 psig as indicated on TEST PRESSURE gage (PG-1). Record pressure in space provided on Performance Test Sheet.

7. If converter supply pressure is not within limits, locate probable cause using troubleshooting chart, table 5-7.

8. Disconnect test stand hose assemblies attached in steps 2 and 3. Close all test stand valves.

9. Remove converter from test stand and allow it to remain undisturbed for 1 hour.

5-51. EVAPORATION LOSS TEST (BUILDUP AND SUPPLY MODE). To perform the Evaporation Loss Test in the buildup and supply mode, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

1. Gently place converter on scale and record time and converter weight on Performance Test Sheet.

2. Place converter assembly aside and allow it to remain undisturbed for 24 hours.

3. Carefully place converter on scale and record time and weight in spaces provided on Performance Test Sheet. Weight loss in 24 hours shall not exceed 3.0 lb.

4. If weight loss is 3.0 lb or less, and there is no excessive frosting of the sphere assembly, drain LOX from converter and proceed to converter charge, paragraph 5-53. If weight loss is in excess of 3.0 lb or if there is sphere assembly frosting, consult troubleshooting chart, table 5-8, then proceed to paragraph 5-52.

Table 5-7. Troubleshooting (Flow Test)

Trouble	Probable Cause	Remedy
Converter fails to maintain operating pressure.	Pressure closing valve out of adjustment.	Adjust (paragraph 5-71, step 31), or replace pressure closing valve.

Table 5-8. Troubleshooting (Evaporation Loss Test, Buildup and Supply Mode)

Trouble	Probable Cause	Remedy
Excessive weight loss.	Loss of vacuum in sphere assembly.	BCM converter assembly.
Excessive weight loss (evaporation loss test (build-up and supply mode)).	Excessively leaking valves, tubing, and/or fittings.	Replace valves. Tighten or replace fittings. Repeat converter leakage test (paragraph 5-47).
	Pressure closing valve out of adjustment or defective.	Adjust pressure closing valve (paragraph 5-71, step 31).
		Replace pressure closing valve.
Frosting of sphere assembly.	Loss of vacuum in sphere.	BCM converter assembly.

5-52. EVAPORATION LOSS TEST (VENTED MODE). To perform the Evaporation Loss Test in the vented mode, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

NOTE

This test is required only if converter fails Evaporation Loss Test in buildup and supply mode. By comparing the weight loss of this test to that recorded during the buildup and supply Evaporation Loss Test, it is possible to determine whether sphere assembly degradation, vacuum loss, fitting leakage, or valve malfunction was responsible for converter failure during the buildup and supply Evaporation Loss Test.

1. With converter still on scale, attach test stand fill valve adapter (P/N 59A120-D5-46) to fill, buildup, and vent valve on converter.

WARNING

Venting a converter that is in a buildup and supply mode causes a blast of LOX from vent port (figure 5-18, item 45). Ensure that vent blast is directed away from all personnel, and that adequate clothing and facial protection are worn.

2. Turn knurled knob of adapter clockwise until it seats. This will place the converter in the vented mode.

3. After converter stabilizes, record time and weight in space provided on Performance Test Sheet.

4. Place converter aside and allow it to remain undisturbed in the vented mode for 24 hours.

5. At the end of the 24-hour period, carefully place converter on scale.

6. Record time and weight in spaces provided on Performance Test Sheet. Weight loss in 24 hours shall not exceed 5.0 lbs.

NOTE

A converter that loses 5.0 lbs or less in the vented mode and the weight loss is more than in the buildup and supply mode (see example A) shall be considered an acceptable unit. If the weight loss is more than 5.0 lbs (see example B) or if the weight loss is less than it was in the buildup and supply mode (see example C) locate probable cause using troubleshooting chart table 5-9.

Example A:
Weight loss
buildup and supply mode = 3.5 lbs.
Weight loss vented mode = 4.0 lbs.
Converter is RFI.

Example B:
Weight loss
buildup and supply mode = 4.0 lbs.
Weight loss vented mode = 6.0 lbs.
Locate probable cause
using troubleshooting chart.

Example C:
Weight loss
buildup and supply mode = 4.0 lbs.
Weight loss vented mode = 3.0 lbs.
Locate probable cause
using troubleshooting chart.

7. Remove fill valve adapter installed in step 1.

WARNING

Ensure that all personnel safety precautions are observed during converter drain.

8. Place converter in LOX drain pan and drain converter completely of all LOX.

5-53. CONVERTER CHARGE. To charge the converter, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Coupling, Quick-disconnect (Female)	199000-1 MS22068-7
1	Hose Assembly, Stand, Test	59A120-B5-14
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

Table 5-9. Troubleshooting (Evaporation Loss Test, Vented Mode)

Trouble	Probable Cause	Remedy
Excessive weight loss (evaporation loss test (vented)).	Loss of vacuum in sphere assembly.	BCM converter assembly.
Weight loss in vented mode is less than in the build-up and supply mode.	Excessively leaking valves, tubing, and/or fittings when unit failed buildup and supply mode evaporation loss test.	Replace valves, Tighten or replace fittings. Repeat converter leakage test (paragraph 5-47).
	Pressure closing valve out of adjustment or defective when unit failed buildup and supply mode evaporation loss test.	Adjust pressure closing valve (paragraph 5-71, step 31).
		Replace pressure closing valve.
Excessive frosting of sphere assembly.	Loss of vacuum in container.	BCM converter assembly.

NOTE

Liquid oxygen converters that fail bench test and are beyond capability of maintenance (BCM) do not require converter charge.

CAUTION

Upon completion of bench test, converter shall be charged with gaseous oxygen to 25 to 30 psig to prevent entry of moisture and other contaminants during shipment/storage.

1. Secure converter in rack provided on test stand counter top.

2. Connect quick-disconnect coupling (P/N 199000-1) to test stand hose assembly (P/N 59A120-B5-14).

3. Using hose assembly, connect test stand BELL JAR BOTTOM COUPLING (C-1) to converter quick disconnect coupling (17, figure 5-18).

4. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

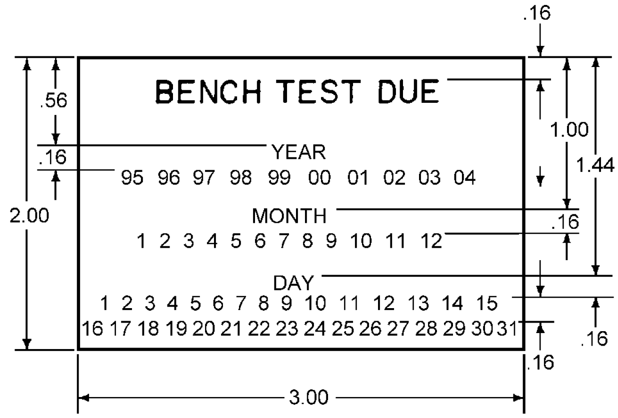
5. Using OXYGEN SUPPLY valve (V-6), charge converter to 25 to 30 psig. Pressure will be indicated on TEST PRESSURE gage (PG-1).

6. Close OXYGEN SUPPLY valve (V-6), disconnect hose assembly connected in step 3, and bleed test stand using SYSTEM BLEED valve (V-5). Secure all test stand valves.

7. Test stand operator and CDI sign Performance Test Sheet. Retain Performance Test Sheet until next scheduled bench test is performed.

8. Mark due-date of next bench test on bench test decal (figure 5-15). Due date shall be 231 days from last Bench Test date. Affix decal to converter in a position in which it will be visible when converter is installed in aircraft.

9. Annotate station/ship performing Bench Test on a serviceable condition label and affix to bench test decal so as not to interfere with marked due date.



NOTES:

1 MATERIAL SHALL BE ELASTOMERIC PRESSURE SENSITIVE TYPE ADHESIVE BACKED, IN ACCORDANCE WITH MIL-M-43719, TYPE I, CLASS 1.
2 ALL LETTERS AND NUMBERS SHALL APPROXIMATELY MATCH GREEN NO. 14187 OF FED. STD. NO. 595; BACKGROUND SHALL APPROXIMATELY MATCH WHITE NO. 17875 OF FED. STD. NO. 595.
3 BENCH TEST DUE SHALL BE 18-POINT GOTHIC (SANS SERIF) LETTERING. ALL OTHER NUMBERS AND LETTERS SHALL BE 10-POINT, GOTHIC (SANS SERIF).

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Figure 5-15. Bench Test Decal

NOTE

Bench test decals may be procured from Customer Service at the nearest NARF.

10. Install dust covers or plugs in/on all open couplings prior to shipping or storing converter.

5-54. DISASSEMBLY.

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical over-pressurization, immediately comply with the emergency pressure relief procedures given in paragraph 5-28 at the beginning of this section.

5-55. Disassemble the liquid oxygen converter using index numbers assigned to figure 5-18, unless otherwise noted. Disassemble the converter only as far as necessary to correct any malfunctions. Disassemble the converter as follows:

CAUTION

All disassembly, inspection, repair, and assembly must be done on benches having good lighting and in an area provided with air conditioning. Walls, floor and ceiling should have a smooth finish, and be painted with a non-chalking paint which can be kept clean and dust free. It is desirable to keep all parts for each individual LOX converter separated. Make careful note of the location, angle of fitting, and quantity of all parts. Plastic partitioned boxes should be used to keep the parts segregated and protected from dirt and moisture. Plastic bags are also useful for storing subassemblies and component parts after cleaning and inspection until ready for assembly.

NOTE

No special tools are required to disassemble, adjust, or assemble this converter.

1. Remove two bolts (7), and remove handle (6).

2. Remove handle clamp (8) by removing two nuts (9) and two screws (10).

3. Remove two clamps (27, 30) from supply line by removing two nuts (28) and two screws (29).

4. Remove supply line (11) by loosening two tube nuts from nipple (12) and orifice valve (13).

5. Remove supply quick-disconnect coupling (17).

6. Remove supply manifold (18) by removing four nuts (19) and four screws (20).

7. Remove clamp (21) from fill line by removing nut (22) and screw (23).

8. Remove clamp (24) from fill line by removing nut (25) and screw (26) and remove cap and chain (16) from nipple (15).

9. Remove fill line (31) by loosening tube nuts from 90° elbow (33) and nipple (32).

10. Remove clamp (34) from gas line (38), vent line (40) and buildup line (43) by removing nut (35) and screw (36).

11. Remove gas line (38) by loosening tube nuts from 90° elbow (39) and lower probe terminals on sphere (88).

12. Remove vent line (40) by loosening tube nuts from 45° elbow (42) and 90° elbow (41).

13. Remove buildup line (43) by loosening tube nuts from 45° elbows (44).

14. Remove fill, buildup and vent valve (51) by removing nut (48) and screw (49) from clamp (47) and removing two nuts (52) and two screws (53).

15. Remove vent quick-disconnect coupling (45) and vent fitting (46) from fill, buildup, vent valve (51).

16. Remove burst disc (37) from 90° elbow (39).

17. Remove two electrical clips (65) by removing nuts (66) and screws (67). This will free dust cap assemblies (68, 69).

18. Remove electric clamp (70) by removing nut (71) and screw (72).

19. Remove three clamps (73) by removing three nuts (74) from three screws (75) (three screws (75) will be removed when cradle mounting assembly (78) is removed).

20. Disconnect and remove capacitance cable assemblies (76, 77).

CAUTION

When removing cradle mounting assembly (78) care must be taken to prevent loss of three screws (75) and damage to sphere assembly (88).

21. Remove cradle assembly (78) and sphere assembly (88) by removing four nuts (79), remove three screws (75) from strap on cradle assembly.

22. Remove buildup coil (84), relief valve (57) and pressure closing valve (58) as one unit by removing clamp (54), nut (55), screw (56), two nuts (59), and screws (60, 61).

23. Remove supply tee assembly (63) from sphere assembly (88).

24. Remove test port tee assembly (14) from supply tee assembly (63).

25. Remove buildup coil (84) from pressure closing valve (58) by loosening tube nut from nipple (64).

26. Remove relief valve (57) from pressure closing valve (58).

NOTE

Only remove nipples, elbows and fittings that require replacing.

27. Remove the two 90° elbows (33, 39) and two 45° elbows (44, 42) from fill, buildup, and vent valve (51).

28. Remove nipple (64) and 45° elbow (44) from pressure closing valve (58).

29. Remove 90° elbow (41) from relief valve (57).

5-56. CLEANING.

5-57. To clean the disassembled converter, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Bag, Plastic	MIL-B-117
As Required	Nitrogen, Oil-free, Water Pumped, Type I, Class I, Grade B	Fed Spec BB-N-411 NIIN 00-985-7275
1	Wash Bottle	MS36070A

WARNING

Do not use oil, or any material containing oil, in conjunction with oxygen equipment. Oil, even in a minute quantity, coming in contact with oxygen can cause explosion or fire. Dust, lint, and fine metal particles are also dangerous.

1. Clean all metallic parts using procedures outlined in NAVAIR 13-1-6.4-1. Blow dry with oil-free nitrogen.

2. Prior to installation, wash all silicone rubber parts in distilled water and blow dry with oil-free nitrogen.

3. After cleaning, surfaces shall be examined for cleanliness. Should further contamination be found, reclean the parts in accordance with step 1.

4. Cleaned parts shall be sealed in plastic bags for storage. Bag all complete assemblies that are not immediately returned to service.

5-58. INSPECTION OF DISASSEMBLED PARTS.

5-59. Inspect the disassembled converter and component parts in accordance with table 5-10 and the following special instructions:

1. Inspect all hardware items (nipples, elbows, etc.) for stripped threads, burrs, nicks, distortion, rust, corrosion, or other defects.

NOTE

Because of the method of suspension of shockmounting of the inner container, some looseness can be detected in most containers by shaking the converter vigorously. Some models employ a spring type suspension that eventually loses some tension. Others have a nylon type spacer that experiences slight shrinkage. Looseness and rattles become more apparent with age. Some looseness can be detected in many new containers. Looseness or rattles is not a criterion for determining serviceability. The integrity of the container is determined by the 24-hour Evaporation Loss Test.

5-60. REPAIR.

5-61. Repair of the converter assembly is limited to replacing defective components, minor repairs (small dents, scratches, abrasions, nicks, etc) of tubing and sphere assembly, reattachment of pinch-off tube protective cover, and touching-up painted surfaces. To make minor repairs, proceed as follows:

Table 5-10. Inspection for Disassembled Parts

Part Nomenclature	Index Number	Inspect For	Remedy
Note: Index numbers in this table refer to figure 5-18.			
Identification and performance plates.	-1 and -3	Legibility, condition and security.	Secure in place, or replace.
Warning and bench test decals.	-5	Presence and condition.	Replace or apply as required.
Handle.	-6	Bends and cracks.	Replace.
Tubing assemblies.	-11, -31, -38, -40, -43, and -84	Cracks, dents, nicks, deep scratches, twists or damaged connectors and tube nuts.	Replace.
Elbows and nipples.	All	Cracks, dents and scratches.	Replace.
Quick disconnects.	-17 and -45	Visible damage.	Replace.
Supply manifold assembly.	-18	Visible damage.	Replace.
Fill, build-up and vent valve assembly.	-51	Cracks, damage thread, and visible damage	Replace/perform bench test.
Clamps.	All	Security and condition	Tighten or replace.
Pressure relief and pressure closing valve.	-57 and -58	Cracks or other visible damage. Presence and condition of Glyptal dots. Presence and condition of safety-wire.	Replace/perform bench test.
Mounting strap, mounting cradle and mounting base assembly.	-87, -78, and -89	Cracks, broken welds, chipped paint or other visible damage.	Replace. Restore finish by components, painting (paragraph 5-61).
Sphere assembly.	-88	Excessive dents, chipped paint or other damage.	Refer to paragraph 5-61 for size of acceptable dents. Restore finish by painting (paragraph 5-61).
Dust caps.	-68 and -69	Broken chain or caps.	Replace.
Electrical clip.	-65	Any damage.	Replace.
Cable assemblies.	-76 and -77	Abrasions and other visible damage.	Replace.
Burst disc.	-37	Stripped threads or other visible damage.	Replace.

Materials Required

Quantity	Description	Reference Number
As Required	Adhesive	NIIN 00-738-6429
As Required	Bushing, Rubber	AN3420-6A
As Required	Glyptal	1201B (CAGE 24452)
As Required	Lacquer-Cellulose Nitrate, Glass Color 622, Jet Black	MIL-L-7178
As Required	Lockwire	MS20995C20
As Required	Paint, Green, (Color 14187)	(Note 1)

Notes: 1. Use any available green paint, chip color 14187, approved by local Environmental Protection Agency.

1. Tubing assemblies with minor dents not causing flow restriction are considered serviceable. Small scratches, abrasions, and nicks can be smoothed with a burnishing tool or aluminum wool.

2. To avoid burnishing the same area more than once, each burnished area shall be identified by a painted band. Color and size of bands are as follows:

a. Color bands shall cover an area not less than 2 inches, nor more than 3 inches in length.

b. Green paint shall be used on black and aluminum tubing.

c. Black lacquer shall be used on green tubing.

d. If tubing is repainted, reidentify burnished area.

3. Areas found to be susceptible to scratching, abrasions, and nicks may be further protected by splitting a length of rubber bushing and placing it around the effected area. Secure bushing in place by wrapping one turn of lockwire at each end.

4. Tubing nicked, abraded, or scratched in an area previously identified as burnished shall be condemned.

5. Sphere assemblies containing minor dents are considered serviceable, provided the sphere passes the vented evaporation loss test. Normally, dents up to 3/8-inch deep will not affect function of the sphere.

WARNING

When painting converter, ensure that fittings, tubing, and valves are removed or masked prior to painting. Paint and other foreign matter associated with painting introduced into these components could create an explosion hazard when contacting oxygen.

6. Sphere assemblies passing the vented evaporation loss test and having dents shall be identified by painting a 3/4-inch diameter dot over each dent using black lacquer.

NOTE

Converters that have actually been critically overpressurized will not pass the bench test. The integrity of the annular space has been lost during the critical overpressurization stage. These converters will frost at the dime like protrusion area and the converter will not pass the evaporation loss test.

Prior to replacing pinch-off tube protective cover, an evaporation loss test (vented condition) shall be performed in accordance with paragraph 5-52. This will ensure that the pinch-off tube was not damaged by whatever force loosened the protective cover.

7. Converters that have partial dime like impressions which were caused by rough handling or improper packaging will normally pass the bench test and can be certified RFI. The partial dime like impressions in this case shall be treated as a dent and painted black and the converter returned to service. If the converter happens to overpressurize in the future there will be a frosting on top of the sphere in the area of the painted dot and a dime like protrusion will begin to form.

8. Pinch-off tube protective covers may be secured back in place over the pinch-off tube as follows:

a. Clean area surrounding pinch-off tube and flange area of protective cover by sanding, followed by cleaning area using procedures outlined in NAVAIR 13-1-6.4-1.

b. Mix equal portion of part "A" resin and part "B" activator. Mix thoroughly following instructions provided with adhesive.

c. Apply adhesive to flange of protective cover. Place cover over pinch-off tube, pressing in place to achieve a good bond. Wipe off excess adhesive and allow cover to remain undisturbed for approximately 8 hours.

5-62. ASSEMBLY.

5-63. Assembly of the liquid oxygen converter assembly is essentially the reverse of disassembly. Test and adjustments are required on certain subassemblies as they are assembled to the converter.

WARNING

Prior to use, inspect leak detection compound. Compound which is not clear and free from suspended material/sediment is considered contaminated and shall be disposed of. Compound exhibiting peculiar odors such as acetone or alcohol is considered contaminated and shall be disposed of.

CAUTION

When installing tubing assemblies, ensure that tubing aligns with fittings to which tube nuts attach. Cross threading should be avoided.

Hold nipples, elbows, tees, etc. with backup wrench to avoid twisting or breakage.

5-64. RELIEF VALVE TEST. To test the relief valve on test stand (P/N 59A120 or similar) prior to its installation, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567
As Required	Glyptal	1201B (CAGE 24452)
As Required	Lock wire	MS20995C20

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-B5-8
1	Hose Assembly, Stand, Test	59A120-B5-12
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Ensure test stand is in secured position.

2. Attach test stand adapter to relief valve.

3. Connect relief valve to test stand BELL JAR BOTTOM COUPLER (C-1).

4. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

5. Close SYSTEM BLEED valve (V-5) and DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8) and open supply cylinder.

6. Open OXYGEN SUPPLY valve (V-6), and apply 95 psig to valve assembly as indicated on TEST PRESSURE gage (PG-1). Check for leakage around test relief valve and connector with leak detection compound. Correct any test stand leakage prior to proceeding.

7. Install test stand bell jar over relief valve and secure in place.

8. Using hose assembly, connect BELL JAR TOP COUPLING (C-2), to FLOWMETER connection (NIP-4).

9. Turn FLOWMETER SELECTOR valve (V-1) to 0-150 lpm position.

CAUTION

Open OXYGEN SUPPLY (V-6) valve and observe TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2) when applying pressure to the relief valve. Damage to the test stand gages could result from rapid surges in pressure.

10. Slowly open OXYGEN SUPPLY valve (V-6) until 100 lpm flow is indicated on FLOWMETER INDICATOR gage (PG-2).

11. With 100 lpm flow indicated on FLOWMETER INDICATOR gage (PG-2), reading on TEST PRESSURE gage (PG-1) shall be 100-120 psig.

NOTE

If reading is not within acceptable limits proceed to paragraphs 5-65, 5-66, or 5-67 for adjustment procedures.

12. Using OXYGEN SUPPLY valve (V-6) and SYSTEM BLEED valve (V-5), reduce pressure applied to relief valve to 95 psig as indicated on TEST PRESSURE gage (PG-1).

13. Disconnect test stand hose from FLOWMETER connection (NIP-4).

CAUTION

When attaching test stand hose to FLOWMETER connection (NIP-1), attach slowly while observing FLOWMETER INDICATOR gage (PG-2), excessive relief valve leakage could damage FLOWMETER INDICATOR gage (PG-2).

14. Turn FLOWMETER SELECTOR valve (V-1) to the 0.0-0.25 lpm position and slowly connect test stand hose to FLOWMETER connection (NIP-1).

15. Maximum allowable leakage as indicated on FLOWMETER INDICATOR gage (PG-2), shall be 0.01 lpm.

16. Relieve pressure using SYSTEM BLEED valve (V-5).

17. Disconnect hose assembly.

18. Remove bell jar.

19. If relief valve vents properly, remove the assembly from test stand and disconnect test stand adapter from relief valve, safety wire and apply Glyptal dot in accordance with figure 5-16. Secure the test stand.

20. If relief valve fails to vent properly, or shows excessive leakage, adjust in accordance with corresponding relief valve Adjustment Procedures:

5-65. ADJUSTMENT PROCEDURES (ESSEX RELIEF VALVE, P/N 20C-0050-2). Adjustment of the Essex Relief Valve (P/N 20C-0050-2) involves 2 potential adjustments (figure 5-16). The valve can normally be brought into tolerance with the pressure adjustment screw; however, adjustment of the spring retainer may be required.

Materials Required

Quantity	Description	Reference Number
1	Glyptal	1201B (CAGE 24452)
1	Hexagonal Nut	MS35649-242 or equivalent
1	Lockwire	MS20995C20
1	Machine Screw	MS35190-228 or equivalent

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-B5-8

NOTE

It may be necessary to adjust the minimum (100 psig) relieving pressure to comply with the maximum allowable leakage (0.01 lpm). This is acceptable, provided the valve relieves 100 lpm at 100 to 120 psig.

1. Thread hexagonal nut on machine screw.

2. Thread machine screw/hex nut assembly into pressure adjustment screw approximately four turns.

3. While holding the machine screw with an appropriate screwdriver, tighten down the hexagonal nut with a 1/4-inch wrench.

4. Remove lockwire from lockscrews, remove Glyptal dots by applying a small amount of acetone.

5. Loosen lockscrew (A).

6. If valve relieves below 100 psig, turn pressure adjusting screw counterclockwise. If relieving above 120 psig, turn adjusting screw clockwise. If valve cannot be adjusted to proper limits, a coarse adjustment must be made using the spring retainer.

7. If valve has been adjusted properly, proceed to step 11.

8. Tighten lockscrew (A).

9. Loosen lockscrew (B).

10. If valve relieves below 100 psig, turn spring retainer 1 turn clockwise. If relieving above 120 psig, turn adjusting screw 1 turn counterclockwise. Retighten lockscrew (B). Repeat step 5 and adjust the valve to proper limits. It may be necessary to repeat this step to obtain proper setting. If valve cannot be adjusted to proper limits, it shall be disposed of in accordance with local directives.

11. Tighten both lockscrews.

12. Loosen hex nut and remove the machine screw/hex nut assembly.

13. Retest valve in accordance with paragraph 5-64.

14. Remove valve assembly from test stand and disconnect test stand connector from relief valve.

15. Lockwire and apply Glyptal dots in accordance with figure 5-16.

5-66. ADJUSTMENT PROCEDURES (ROCKET JET RELIEF VALVE, P/N 10525-2). Adjustment of the Rocket Jet Relief Valve (P/N 10525-2) involves 3 components of the valve (figure 5-16). The first is a locknut which is used for tightening the complete adjustment assembly. The second is a small guide screw located on the inside of the locknut, which is adjusted using an allen wrench. This part is not responsible for the performance of the valve. The third part, the spring adjustment screw, adjusts the pressure at which the valve will relieve. It is located under the locknut and can be adjusted by a screwdriver only after removal of the locknut and the guide screw.

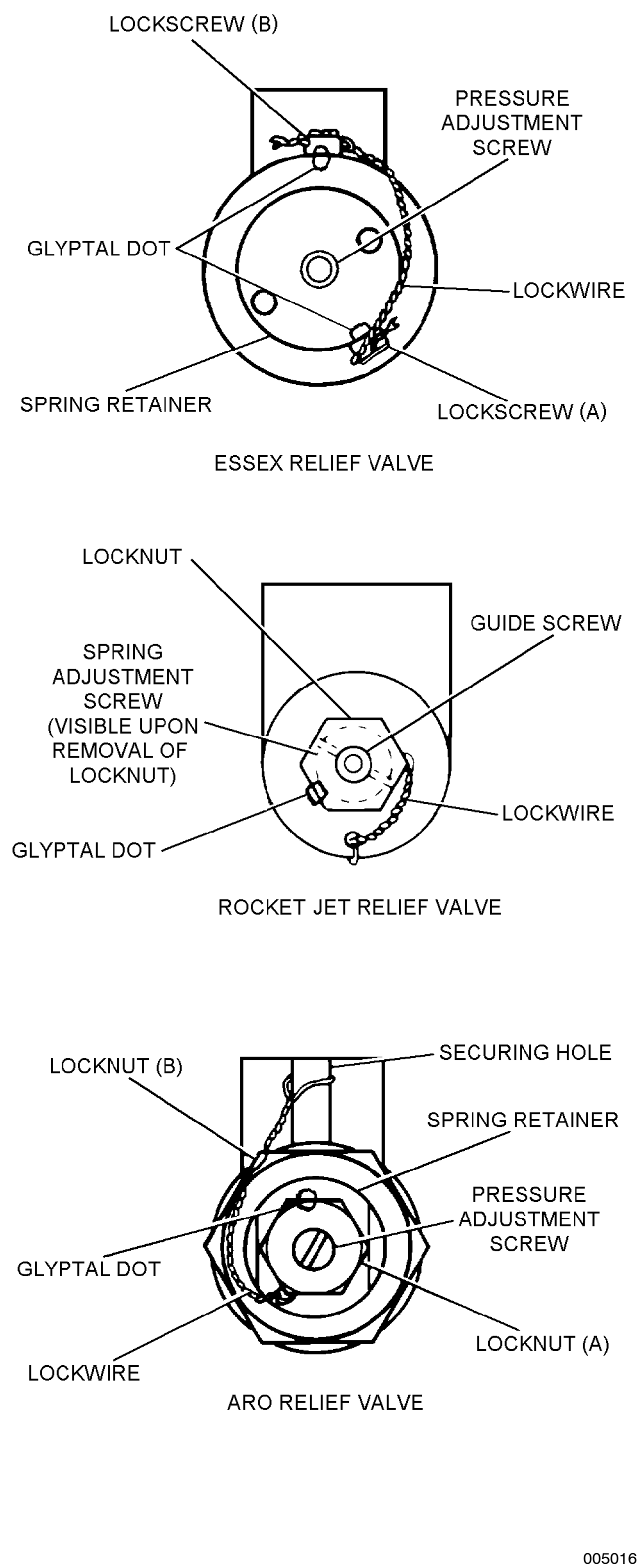

Figure 5-16. Application of Glyptal Dot(s) and Lockwire to Relief Valve

Materials Required

Quantity	Description	Reference Number
1	Glyptal	1201B (CAGE 24452)
1	Lockwire	MS20995C20

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-B5-8

NOTE

It may be necessary to adjust the minimum (100 psig) relieving pressure to comply with the maximum allowable leakage (0.01 lpm). This is acceptable, provided the valve relieves 100 lpm at 100 to 120 psig.

1. Remove lockwire from locknut, remove Glyptal dot by applying a small amount of acetone.

2. Remove locknut using a 3/8-inch wrench.

3. Remove guide screw using a 3/32-inch allen wrench.

4. If valve relieves below 100 psig, turn spring adjustment screw clockwise with a screwdriver. If valve relieves above 120 psig, turn spring adjustment screw counterclockwise. It may be necessary to repeat this step to obtain proper setting. If spring adjustment screw is removed, teflon tape must be applied to ensure a proper seal. If valve cannot be adjusted to proper limits, it shall be disposed of in accordance with local directives.

CAUTION

Ensure spring adjustment screw does not turn out of adjustment while installing the guide screw and locknut.

5. Reinstall guide screw and turn clockwise until slight resistance is felt (screw bottomed out). Reinstall locknut.

6. Using the allen wrench, turn the guide screw 2 full turns counterclockwise.

CAUTION

Extreme care should be taken towards keeping the guide screw in its adjusted position when tightening the locknut as deviation from this position could cause the valve not to relieve at any pressure.

7. Tighten the locknut ensuring that the allen wrench and guide screw are in their adjusted position.

8. Retest valve in accordance with paragraph 5-64.

9. Remove valve assembly from test stand and disconnect test stand connector from relief valve.

10. Lockwire and apply Glyptal dot in accordance with figure 5-16.

5-67. ADJUSTMENT PROCEDURES (ARO RELIEF VALVE, P/N 21247-1). Adjustment of the ARO Relief Valve (P/N 21247-1) involves 2 potential adjustments (figure 5-16). The valve can normally be brought into tolerance with the pressure adjustment screw; however, adjustment of the spring retainer may be required.

Materials Required

Quantity	Description	Reference Number
1	Glyptal	1201B (CAGE 24452)
1	Lockwire	MS20995C20

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-B5-8

NOTE

It may be necessary to adjust the minimum (100 psig) relieving pressure to comply with the maximum allowable leakage (0.01 lpm). This is acceptable, provided the valve relieves 100 lpm at 100 to 120 psig.

1. Remove lockwire from locknuts, remove Glyptal dot by applying a small amount of acetone.

2. Loosen locknut (A).

3. If valve relieves below 100 psig, turn adjusting screw counterclockwise. If relieving above 120 psig, turn adjusting screw clockwise. If valve cannot be adjusted to proper limits, a coarse adjustment must be made using the spring retainer.

4. If valve has been adjusted properly, proceed to step 8.

5. Tighten locknut (A).

6. Loosen locknut (B).

7. If valve relieves below 100 psig, turn spring retainer 1 turn clockwise. If relieving above 120 psig, turn adjusting screw 1 turn counterclockwise. Tighten locknut (B). Repeat steps 2 thru 5 and attempt to adjust the valve to proper limits. It may be necessary to repeat this step to obtain proper setting. If valve cannot be adjusted to proper limits, it shall be disposed of in accordance with local directives.

8. Tighten both locknuts.

9. Retest valve in accordance with paragraph 5-64.

10. Remove valve assembly from test stand and disconnect test stand connector from relief valve.

11. Lockwire valve from locknut (A) to locknut (B) to securing hole and apply Glyptal dot in accordance with figure 5-16.

5-68. PRESSURE CLOSING VALVE LEAKAGE TEST. To test the pressure closing valve for leakage prior to installation, proceed as follows:

Materials Required

Quantity	Description	Reference Number
1	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	Connector Assembly, Test Stand	59A120-C5-18
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1
1	Plug Assembly, Test Stand	59A120-B5-16

NOTE

Index numbers in parentheses refer to figure 5-17.

1. Plug relief valve port (4) with test stand plug assembly.

2. Attach pressure gage to buildup tube port (6).

3. Attach test stand connector assembly to buildup coil port (5).

4. Attach closing valve to BELL JAR BOTTOM COUPLING (C-1).

5. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

6. Open OXYGEN SUPPLY valve (V-6), and apply 120 psig as indicated on TEST PRESSURE gage (PG-1). Gage attached to buildup tube port (6) should read between 55 and 90 psig.

NOTE

If pressure at buildup tube port does not fall within the 55 to 90 psig limit, adjust pressure closing valve in accordance with paragraph 5-71, step 31.

7. Apply leak detection compound to bellows retainer (3) and valve body. No leakage is allowed. If leakage is noted, replace valve assembly.

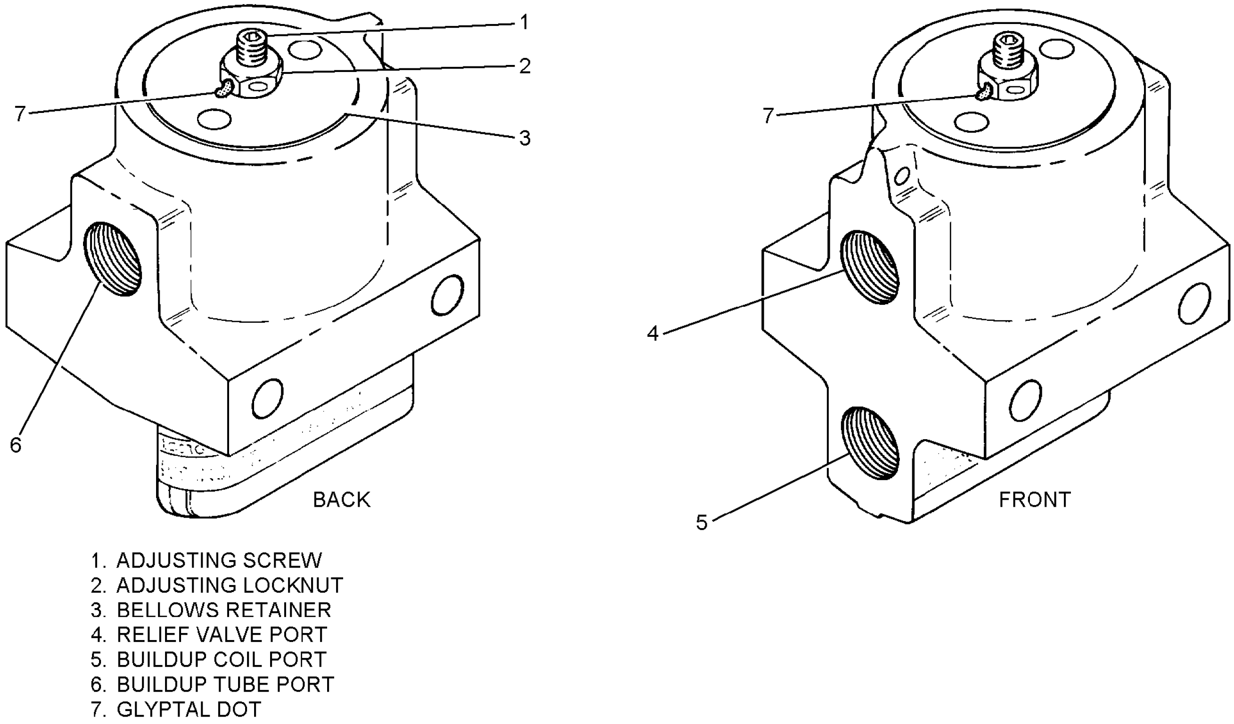

Figure 5-17. Pressure Closing Valve

8. Ensure that 120 psig is indicated on TEST PRESSURE gage (PG-1). Hold pressure for 5 minutes. Any increase of pressure shown on gage attached to buildup tube port (6) indicates internal leakage and cause for rejection.

9. Close OXYGEN SUPPLY valve (V-6), and bleed test stand using SYSTEM BLEED valve (V-5).

10. Remove pressure closing valve from test stand. Remove plug, gage, and connector from valve. Installation and further adjustments are performed in paragraph 5-71.

5-69. FILL, BUILDUP AND VENT VALVE TEST. To test the fill, buildup, and vent valve for leakage prior to installation, proceed as follows:

Materials Required

Quantity	Description	Reference Number
1	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	Connector Assembly, Test Stand	59A120-C5-39
1	Hose Assembly, Stand, Test	59A120-B5-12
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1
1	Plug Assembly, Test Stand	59A120-B5-38

NOTE

The testing of valve requires calculations. Use the blank space, after step 11, on the Performance Test Sheet to record measurements and perform calculations.

1. Plug gas and vent ports of valve using test stand plugs.

2. Attach test stand connector assembly to fill outlet port of valve.

3. Install fill, buildup, and vent valve with connector and plugs attached in test stand BELL JAR BOTTOM COUPLING (C-1).

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly when applying pressure to valve. Damage to test stand gages could result from surges in pressure.

4. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2) and close DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8).

5. Open OXYGEN SUPPLY valve (V-6) and apply 70 psig to valve assembly. Check for leakage around test stand plugs and couplings with leak detection compound. Correct any test stand leakage prior to proceeding.

6. Install test stand bell jar over fill, buildup, and vent valve, and secure in place.

7. Using test stand hose assembly (P/N 59A120-B5-12), interconnect BELL JAR TOP COUPLING (C-2) and FLOWMETER connection (NIP-1).

8. Turn FLOWMETER SELECTOR valve (V-1) to the 0.0-0.25 lpm position.

CAUTION

When applying pressure in step 9, observe both TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2). Excessive leakage from fill, buildup, and vent valve could damage FLOWMETER INDICATOR gage (PG-2).

9. Maintain 70 psig to the fill, buildup, and vent valve for 2 minutes. Leakage from the fill inlet port, indicated on FLOWMETER INDICATOR gage (PG-2), shall not exceed 0.02 lpm.

10. Close OXYGEN SUPPLY valve (V-6). Bleed pressure from test stand with SYSTEM BLEED valve (V-5).

CAUTION

Ensure pressure is bled from test stand prior to opening DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8). Overpressurization could damage DIFFERENTIAL PRESSURE gage (DF-1).

11. Open DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8).

CAUTION

When applying pressure in step 12, observe both DIFFERENTIAL PRESSURE gage (DF-1) and FLOWMETER INDICATOR gage (PG-2). Excessive leakage from fill, buildup and vent valve could damage FLOWMETER INDICATOR gage (PG-2).

12. Slowly open OXYGEN SUPPLY valve (V-6) to apply 10 inH_2O, as indicated on DIFFERENTIAL PRESSURE gage (DF-1). Maintain pressure for 2 minutes. Leakage, indicated on FLOWMETER INDICATOR gage (PG-2), shall not exceed 0.002 lpm.

13. If leakage in steps 9 or 12 exceeds 0.02 lpm, replace valve.

14. Close OXYGEN SUPPLY valve (V-6). Bleed pressure from test stand with SYSTEM BLEED valve (V-5). Close DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8).

15. Remove test stand bell jar. Remove test stand plug from vent port of fill, buildup, and vent valve.

16. Place test stand bell jar back in position over fill, buildup, and vent valve. Using test stand hose assembly, interconnect BELL JAR TOP COUPLING (C-2) and FLOWMETER connection (NIP-1).

17. Turn FLOWMETER SELECTOR valve (V-1) to the 0.0-0.25 lpm position.

CAUTION

When applying pressure in step 18, observe both TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2). Excessive leakage could damage flowmeter indicator gage (PG-2).

18. Open OXYGEN SUPPLY valve (V-6) and apply 70 psig to valve assembly. Maintain 70 psig to the fill, buildup, and vent valve for 2 minutes. Leakage from the vent port indicated on FLOWMETER INDICATOR gage (PG-2), shall not exceed 0.05 lpm.

19. Close OXYGEN SUPPLY valve (V-6). Bleed pressure from test stand with SYSTEM BLEED valve (V-5).

CAUTION

Ensure pressure is bled from test stand prior to opening DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8). Overpressurization could damage DIFFERENTIAL PRESSURE gage (DF-1).

20. Open DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8).

CAUTION

When applying pressure in step 21 observe both DIFFERENTIAL PRESSURE gage (DF-1) and FLOWMETER INDICATOR gage (PG-2). Excessive leakage could damage FLOWMETER INDICATOR gage (PG-2).

21. Slowly open OXYGEN SUPPLY valve (V-6) to apply 10 inH_2O, as indicated on DIFFERENTIAL PRESSURE gage (DF-1). Maintain pressure for 2 minutes. Leakage, indicated on FLOWMETER INDICATOR gage (PG-2), shall not exceed 0.05 lpm.

NOTE

Vent port leakage is determined by subtracting the leakage noted in step 9 from that shown in step 18 and leakage noted in step 12 from that shown in step 21. In either case, leakage from the vent port shall not exceed 0.05 lpm.

22. If leakage in step 18 or 21 exceeds 0.05 lpm, replace valve.

23. Close OXYGEN SUPPLY valve (V-6). Bleed pressure from test stand with SYSTEM BLEED valve (V-5). Close DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8).

24. Remove test stand hose assembly from BELL JAR TOP COUPLING (C-2) and FLOWMETER connection (NIP-1). Remove bell jar.

25. Remove fill, buildup, and vent valve from test stand. Remove plug from gas port and connector from fill outlet port of valve. Set valve assembly aside. Installation will be covered later in this section.

5-70. COMPLETION OF ASSEMBLY.

5-71. To complete assembly of converter components, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567
As Required	Glyptal	1201B (CAGE 24452)
As Required	Lock wire	MS20995C20
As Required	Tape, Anti-seize	MIL-T-27730

CAUTION

When installing tube assemblies, ensure fittings to which tube nuts are to be attached are properly aligned with tube to prevent cross threading. Hold connecting fittings with open end wrench to avoid straining or breakage when tightening. Hold tubing away from other components of converter assembly while tightening so that a minimum 1/16 inch clearance is maintained. It may be necessary to slightly bend some tube assemblies to maintain this clearance. Ensure tubing is not crimped after bending process.

Use anti-seize tape on all male pipe thread fittings. Apply single layer of tape, overlapping ends just enough to avoid gap in tape when fitting is installed. To prevent tube blockage, ensure tape is clear of last thread.

Do not use anti-seize tape on flared or straight thread fittings.

NOTE

Index numbers in parentheses refer to figure 5-18.

1. Install 45° elbow (44) to pressure closing valve (58) and 90° elbow to relief valve (57).

2. Install relief valve (57) into pressure closing valve (58). Install nipple (64) into port provided on pressure closing valve (58).

3. Prior to installing assembled relief valve (57) and pressure closing valve (58), leak test assembled elbows and nipple as follows:

   a. Cap elbow (44) and apply 90 psig to nipple (64).

   b. Check for leakage using leak detection compound.

   c. Correct any leakage prior to installation of valves.

4. Attach one end of buildup coil (84) to nipple (64) on pressure closing valve.

5. Attach buildup coil (84), relief valve (57), and pressure closing valve (58) on converter mounting base (89) and secure with clamps (62, 54), nut (55), screw (56), two nuts (59), and screws (60, 61).

6. Attach dust caps (68, 69) and two electrical clips (65) to mounting cradle assembly (78) with two screws (67) and nuts (66).

7. Attach capacitance cable assemblies (76, 77) to cradle mounting assembly (78) and secure with two nuts provided, electric clamp (70), nut (71), screw (72), three clamps (73), three nuts (74), and three screws (75). Place dust caps (68, 69) over cable terminals.

8. Attach handle (6) to cradle mounting assembly (78) and secure with two bolts (7).

9. Attach handle clamp (8) to cradle mounting assembly (78) and secure with two nuts (9) and two screws (10).

10. Attach test port tee assembly (14) to supply tee assembly (63).

11. Install supply tee assembly (63) and test port tee (14) on converter sphere assembly (88).

12. Install two clamps (80) and clamp (27) on buildup coil (84).

13. Place strap and handle assembly (87) and cradle mounting assembly (78) over sphere assembly (88).

14. Secure cradle mounting assembly (78) and sphere assembly (88) to converter mounting base (89) by placing front strap through 2 clamps (80) and then insert all four straps through drilled holes in converter mounting base and secure with 4 nuts (79).

15. Install 90° elbow (39) into gas port, 90° elbow (33) into fill port and 45° elbow into buildup port of fill, buildup, and vent valve (51).

16. Install vent quick-disconnect coupling (45) onto vent fitting (46), and install two parts as a unit to vent port of fill, buildup, and vent valve assembly (51).

17. Prior to installing fill, buildup, and vent valve (51), leak test assembled elbows as follows:

   a. Cap elbow (44) installed in buildup port.

   b. Apply 90 psig to gas port of valve. Check for leakage using leak detection compound.

c. Remove cap installed above and apply 90 psig to fill out port of valve. Check for leakage using leak detection compound.

d. Correct any leakage prior to installation of valve.

18. Install burst disc (37) into 90° elbow (39), install fill, buildup, and vent valve (51) on converter mounting base (89). Secure with clamp (47), nut (48), screw (49), two nuts (52) and two screws (53).

18A. Install cap assembly (P/N MS27566-1) onto fill, build-up, and vent valve assembly (51) and secure to converter mounting base (89) with screw (P/N AN516C6-8) and self-locking nut (P/N MS20365D632).

19. Install supply manifold (18) on converter mounting base (89) and secure with four nuts (19) and four screws (20).

20. Screw supply quick-disconnect coupling (17) on supply manifold (18).

21. Attach 3 tube clamps (34) to tube assemblies (38), (40), and (43) and secure loosely with nut (35) and screw (36).

22. Attach tube assembly (38) to 90° elbow (39) located on gas port of fill, buildup, and vent valve (51) and to lower probe body housing on sphere assembly (88).

23. Attach tube assembly (40) to 45° elbow (42) and 90° elbow (42) and 90° elbow (41).

24. Attach tube assembly (43) to two 45° elbows (44) located on fill, buildup, and vent valve (51) and pressure closing valve (58) and secure 3 tube clamps (34) with nut (35) and screw (36).

25. Position tube clamp (24) and cap and chain assembly (16) on tube assembly (31) with nut (25) and screw (26) approximately 2 inches from tube assembly end that attaches to nipple (32).

26. Attach tube clamp (21) with nut (22) and screw (23) on tube assembly (31).

27. Attach tube assembly (31) to 90° elbow (33) and nipple (32).

28. Attach buildup coil assembly (84) to nipple (64).

29. Attach tube clamps (27) and (30) with nut (28) and screw (29) on tube assembly (11) and attach tube assembly (11) to nipple (12) and orifice valve (13).

30. After assembly, Bench Test the converter (paragraph 5-40).

31. During post-assembly bench test, it may be necessary to adjust the pressure closing valve (58) when performing the flow test. If so, proceed as follows:

NOTE

Index numbers in parentheses refer to figure 5-17.

a. Cut and remove lockwire from adjusting locknut (2). Remove Glyptal dot by applying a small amount of acetone.

NOTE

The 70 to 75 psig operating pressure is for adjustment purposes only. If converter maintains 55 to 90 psig, no adjustment is required. If converter pressure is above or below this range, adjust pressure closing valve to maintain 70 to 75 psig.

b. Using an Allen wrench, turn adjusting screw (1) so a supply pressure of 70 to 75 psig is maintained with a flow of 120 lpm. Turning adjusting screw counterclockwise decreases pressure and turning clockwise increases pressure. Flow the converter for at least 15 minutes to ensure pressure is constant.

c. Tighten adjusting locknut (2) and safety-wire, using lockwire.

d. Apply Glyptal dot (7) to adjusting locknut (2) but not to threads of adjustment screw (1).

Section 5-5. Illustrated Parts Breakdown

5-72. GENERAL.

5-73. This Section lists and illustrates the assemblies and detail parts of the Liquid Oxygen Converter Assembly, Type GCU-24/A, P/N 10C-0016-16, manufactured by Essex Industries, Inc. (CAGE 19062).

5-74. The Illustrated Parts Breakdown should be used during maintenance when requisitioning and identifying parts.

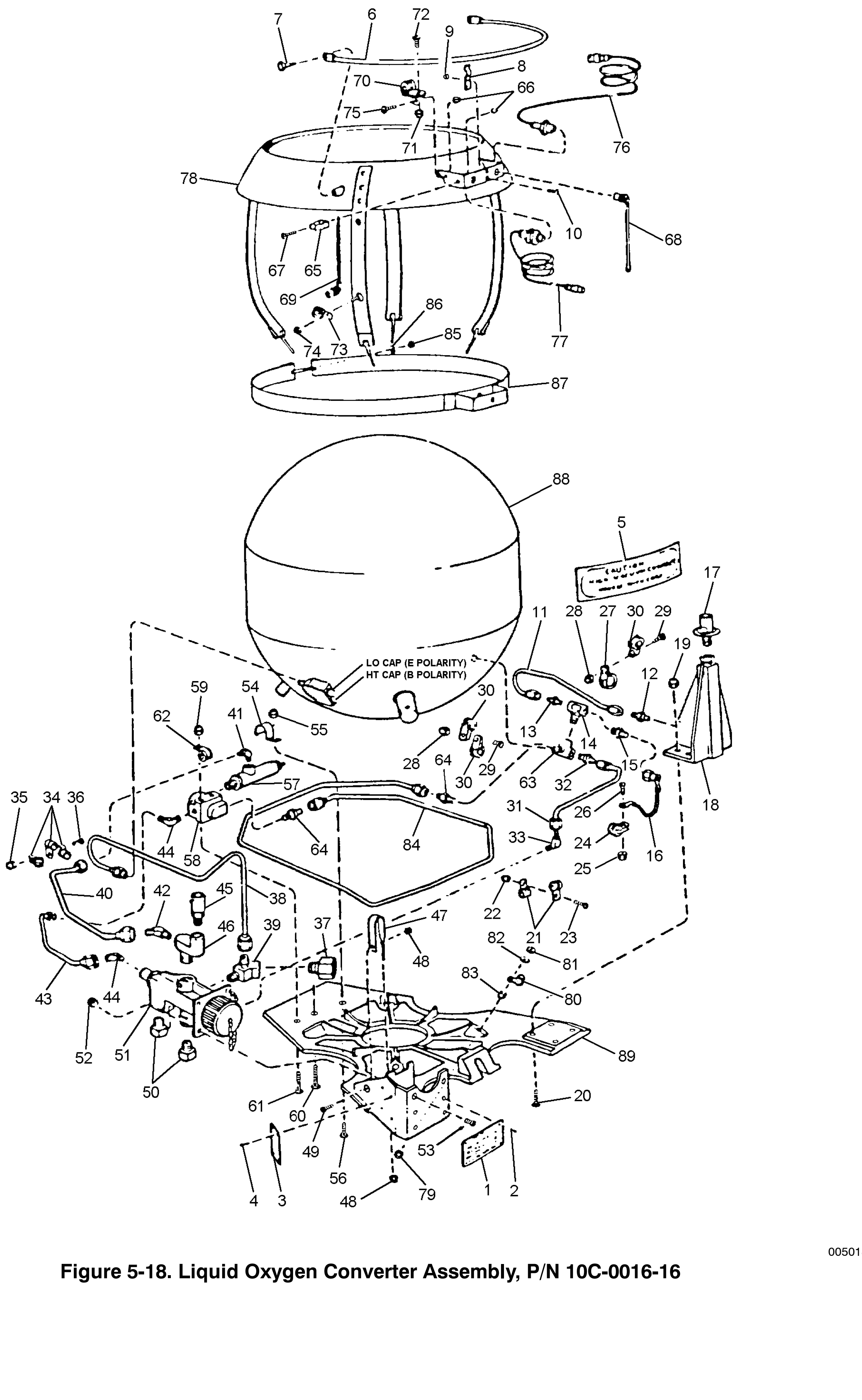

Figure 5-18. Liquid Oxygen Converter Assembly, P/N 10C-0016-16

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
5-18	10C-0016-16	CONVERTER ASSEMBLY, Liquid oxygen, 10 liter	1	C
-1	10C-0016-0068	. PLATE, Identification	1	
		(ATTACHING PARTS)		
-2	MS21318-1	. SCREW, Drive, Rd. Hd.	4	
		---*---		
-3	10C-0016-0021	. PLATE, Vacuum performance	1	
		(ATTACHING PARTS)		
-4	MS21318-1	. SCREW, Drive, Rd. Hd.	4	
-5	10C-0001-0033	. DECAL, Warning	1	
-6	10C-0016-0009	. HANDLE, Converter	1	
		(ATTACHING PARTS)		
-7	10C-0016-0026	. BOLT, Hex. Hd. Shld., No. 10-32 NF-2A x 5/16	2	
		---*---		
-8	10C-0016-0008	. CLAMP, Handle	1	
		(ATTACHING PARTS)		
-9	MS21044-D06	. NUT, Self-locking	2	
-10	MS51957-29	. SCREW, Mach., Rd. Hd.	2	
		---*---		
-11	10C-0016-0041	. TUBE ASSEMBLY, Supply	1	
-12	AN816-5D	. NIPPLE	1	
-13	20C-0009-1	. VALVE, Orifice	1	
-14	10C-0016-0058	. TEE	1	
-15	AN816-5D	. NIPPLE	1	
-16	20C-0007-0003	. CAP AND CHAIN ASSEMBLY	1	
-17	528000-4	. COUPLING ASSEMBLY, Quick disconnect	1	
	199002	. SEAL (Not Shown) (83533) used on P/N 528000-4	1	
-18	10C-0016-0063	. MANIFOLD ASSEMBLY, Supply	1	
		(ATTACHING PARTS)		
-19	MS21044D3	. NUT, Self-locking	4	
-20	MS24693-C275	. SCREW, Mach., flat Hd.	4	
		---*---		
-21	MS21919WDG5	. CLAMP, Tube	2	
		(ATTACHING PARTS)		
-22	MS21044D06	. NUT, Self-locking	1	
-23	MS51957-28	. SCREW, Mach., Rd. Hd	1	
		---*---		
-24	MS21919WDG5	. CLAMP, Tube	1	
		(ATTACHING PARTS)		
-25	MS21044D06	. NUT, Self-locking	1	
-26	MS51957-28	. SCREW, Mach., Rd. Hd.	1	
		---*---		
-27	MS21919WDG8	. CLAMP, Tube	1	
		(ATTACHING PARTS)		
-28	MS21044D06	. NUT, Self-locking	1	
-29	MS51957-28	. SCREW, Mach., Rd. Hd	1	
		---*---		

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
5-18-30	MS21919WDG5	. CLAMP, Tube	3	
-31	10C-0016-0038	. TUBE ASSEMBLY, Fill	1	
-32	AN816-5D	. NIPPLE	1	
-33	MS20822-5D	. ELBOW, 90°	1	
-34	MS21919WDG5	. CLAMP, Tube	3	
		(ATTACHING PARTS)		
-35	MS21044D06	. NUT, Self-locking	1	
-36	MS51957-29	. SCREW, Mach., Rd. Hd	1	
		---*---		
-37	10C-0016-0061	. BURST ASSEMBLY, Disc	1	
-38	10C-0016-0039	. TUBE ASSEMBLY, Gas	1	
-39	10C-0016-0060	. ELBOW, 90°	1	
-40	10C-0016-0042	. TUBE ASSEMBLY, Relief	1	
-41	MS20822-5D	. ELBOW, 90°	1	
-42	MS20823-5D	. ELBOW, 45°	1	
-43	10C-0016-0040	. TUBE ASSEMBLY, Build-up	1	
-44	MS20823-5D	. ELBOW, 45°	2	
-45	256000-8	. COUPLING ASSEMBLY, Quick disconnect . . . . . (70 P.S.I.)	1	
-46	10C-0016-0019	. FITTING, Vent	1	
-47	10C-0016-0028	. STRAP ASSEMBLY, Mounting	1	
		(ATTACHING PARTS)		
-48	MS21044D3	. NUT, Self-locking	2	
-49	MS51958-63	. SCREW, Mach., Rd. Hd	1	
		---*---		
-50	10C-0016-0029	. ELBOW, 90°	2	
-51	0580560100-1	. VALVE ASSEMBLY, Fill, build-up & vent . . . . . . (439000-3 alternate)	1	
	439077	. HEAD GASKET ASSEMBLY, (Not Shown) . . . . . (83533) Used on 439000-3	1	
		(ATTACHING PARTS)		
-52	MS21044D3	. NUT, Self-locking	2	
-53	MS24693-C274	. SCREW, Mach., flat Hd	2	
		---*---		
-54	10C-0016-0024	. CLAMP, Valve relief	1	
		(ATTACHING PARTS)		
-55	MS21044D3	. NUT, Self-locking	1	
-56	MS24693-C273	. SCREW, Mach., flat Hd	1	
		---*---		
-57	20C-0050-2	. VALVE, Pressure relief (Note 1)	1	
-58	20C-0008-1	. VALVE, Pressure closing	1	
		(ATTACHING PARTS)		
-59	MS21044D3	. NUT, Self-locking	2	
-60	MS24693-C282	. SCREW, Mach., flat Hd	1	
-61	MS24693-C283	. SCREW, Mach., flat Hd	1	
		---*---		

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
5-18-62	MS21919WDG5	. CLAMP, Tube	1	
-63	10C-0016-0036	. TEE ASSEMBLY, Supply	1	
-64	AN816-5D	. NIPPLE	2	
-65	10C-0001-0034	. CLIP, Electrical	2	
		(ATTACHING PARTS)		
-66	MS21044D06	. NUT, Self-locking	2	
-67	MS51957-29	. SCREW, Mach., Rd. Hd	2	
		---*---		
-68	10C-0001-0009	. CAP ASSEMBLY, Dust “E” polarity (120°)	1	
-69	10C-0001-0008	. CAP ASSEMBLY, Dust “B” polarity (180°)	1	
-70	10C-0016-0046	. CABLE CLAMP, Electrical	1	
		(ATTACHING PARTS)		
-71	MS21044D06	. NUT, Self-locking	1	
-72	MS51957-28	. SCREW, Mach., Rd. Hd	1	
		---*---		
-73	MS21919WDG2	. CLAMP ASSEMBLY, Electrical	3	
		(ATTACHING PARTS)		
-74	MS21044D06	. NUT, Self-locking	1	
-75	MS51957-28	. SCREW, Mach., Rd. Hd	1	
		---*---		
-76	10C-0016-0031	. CABLE ASSEMBLY, Lo-capacitance, “E” polarity	1	
-77	10C-0016-0032	. CABLE ASSEMBLY, Hi-capacitance, “B” polarity	1	
-78	10C-0016-0067	. CRADLE ASSEMBLY, Mounting	1	
		(ATTACHING PARTS)		
-79	MS21044N4	. NUT, Self-locking	4	
		---*---		
-80	10C-0020-0040	. CLAMP, Tube	2	
		(ATTACHING PARTS)		
-81	AN345C416	. NUT, Plain	2	
-82	MS35338-43	. WASHER, Lock	2	
-83	10C-0020-0042	. FERRULE	2	
-84	10C-0016-0043	. COIL ASSEMBLY, Build-up	1	
-85	MS21044D08	. NUT, Self-locking	1	
-86	AN960C8	. WASHER, Flat	1	
-87	10C-0016-0017	. STRAP AND HANDLE ASSEMBLY	1	
-88	10C-0016-0035	. SPHERE ASSEMBLY	1	
-89	10C-0016-0066	. BASE, Converter mounting	1	
Ref.	40C-0016-11	. KIT, Converter @ Vhl.	1	
	Notes: 1. Relief valves, P/N 20C-0050-2, P/N 20C-0005-20, P/N 10525-2 (CAGE 97413), and P/N 21247-1 (CAGE 97413), are interchangeable.			

NUMERICAL INDEX

Part Number	Figure and Index Number	SM&R Code
AN345C416	5-18-81	PAOZZ
AN816-5D	5-18-12	PAOZZ
	5-18-15	
	5-18-32	
	5-18-64	
AN960C8	5-18-86	PAOZZ
MS20822-5D	5-18-33	PAOZZ
	5-18-41	
MS20823-5D	5-18-42	PAOZZ
	5-18-44	
MS21044D06	5-18-9	PAOZZ
	5-18-22	
	5-18-25	
	5-18-28	
	5-18-35	
	5-18-66	
	5-18-71	
	5-18-74	
MS21044D08	5-18-85	PAOZZ
MS21044D3	5-18-19	PAOZZ
	5-18-48	
	5-18-52	
	5-18-55	
	5-18-59	
MS21044N4	5-18-79	PAOZZ
MS21318-1	5-18-2	PAOZZ
	5-18-4	
MS21919WDG2	5-18-73	PAOZZ
MS21919WDG5	5-18-21	PAOZZ
	5-18-24	
	5-18-30	
	5-18-34	
	5-18-62	
MS21919WDG8	5-18-27	PAOZZ
MS24693-C273	5-18-56	PAOZZ
MS24693-C274	5-18-53	PAOZZ
MS24693-C275	5-18-20	PAOZZ
MS24693-C282	5-18-60	
MS24693-C283	5-18-61	PAOZZ
MS35338-43	5-18-82	PAOZZ
MS51957-28	5-18-23	PAOZZ
	5-18-26	
	5-18-29	
	5-18-72	
	5-18-75	
MS51957-29	5-18-10	PAGZZ
	5-18-36	

Part Number	Figure and Index Number	SM&R Code
	5-18-67	
MS51958-63	5-18-49	PAOZZ
0580560100-1	5-18-51	
10C-0001-0008	5-18-69	PAOZZ
10C-0001-0009	5-18-68	PAOZZ
10C-0001-0033	5-18-5	
10C-0001-0034	5-18-65	PAOZZ
10C-0016-0008	5-18-8	PAGZZ
10C-0016-0009	5-18-6	PAGZZ
10C-0016-0017	5-18-87	PAOZZ
10C-0016-0019	5-18-46	PAOZZ
10C-0016-0021	5-18-3	
10C-0016-0024	5-18-54	
10C-0016-0026	5-18-7	PAOZZ
10C-0016-0028	5-18-47	PAOZZ
10C-0016-0029	5-18-50	PAOZZ
10C-0016-0031	5-18-76	PAOZZ
10C-0016-0032	5-18-77	PAOZZ
10C-0016-0035	5-18-88	
10C-0016-0036	5-18-63	
10C-0016-0038	5-18-31	PADZZ
10C-0016-0039	5-18-38	PAOZZ
10C-0016-0040	5-18-43	PAOZZ
10C-0016-0041	5-18-11	PAOZZ
10C-0016-0042	5-18-40	PAOZZ
10C-0016-0043	5-18-84	PAOZZ
10C-0016-0046	5-18-70	
10C-0016-0058	5-18-14	
10C-0016-0060	5-18-39	PADZZ
10C-0016-0061	5-18-37	PADZZ
10C-0016-0063	5-18-18	PADZZ
10C-0016-0066	5-18-89	
10C-0016-0067	5-18-78	PAGZZ
10C-0016-0068	5-18-1	
10C-0016-16	5-18-	PAOGD
10C-0020-0040	5-18-80	
10C-0020-0042	5-18-83	
199002	5-18-17	
256000-8	5-18-45	PAOZZ
20C-0007-0003	5-18-16	
20C-0008-1	5-18-58	PAOZZ
20C-0009-1	5-18-13	
20C-0050-2	5-18-57	PAOZZ
439000-3		
439077	5-18-51	
528000-4	5-18-17	PAOZZ
40C-0016-11	REF	

CHAPTER 6

LIQUID OXYGEN CONVERTER ASSEMBLY

TYPE GCU-24/A, P/N 29073-D2

Section 6-1. Description

6-1. GENERAL.

6-2. The Liquid Oxygen Converter Assembly, Type GCU-24/A, P/N 29073-D2, (figure 6-1) is manufactured by Litton Life Support, formerly Bendix Corporation (CAGE 99251). The converter assembly is designed to store and convert liquid oxygen (LOX) into gaseous oxygen for the aircrewmember during flight. Table 6-1 contains the leading particulars for the converter assembly.

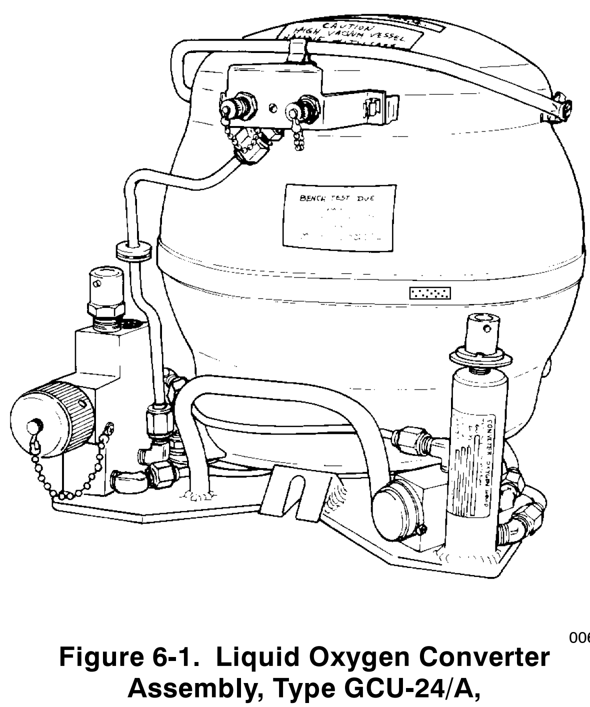

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Figure 6-1. Liquid Oxygen Converter Assembly, Type GCU-24/A, P/N 29073-D2

6-3. Oxygen in its liquid state (approximately -297°F (-182°C)), is stored in a spherical assembly consisting of inner and outer shells separated by an annular space. The annular space is evacuated, creating a vacuum, preventing the transmittal of heat through the space. The thermos bottle effect created retards heating and eventual conversion of LOX to gaseous oxygen. Valves, tubing and fittings incorporated in the converter assembly convert LOX to gas and direct its flow at a controlled rate.

Table 6-1. Leading Particulars

Capacity (LOX)	10 liters
Operating pressure	55 to 90 psig
Operating temperature range	-65°F (-54°C) to +260°F (+127°C)
Relief valve setting	100 to 120 psig
Pressure closing valve setting	55 to 90 psig
Delivery rate	120 lpm (min)
Filling time at 70°F	10 min
Buildup time (max)	5 min

6-4. CONFIGURATION.

6-5. The Liquid Oxygen Converter Assembly, Type GCU-24/A, P/N 29073-D2, consists of a container assembly, combination valve with relief valve incorporated, pressure closing valve and associated tubing and fittings. A capacitance-type probe assembly, which sends an electrical signal to a liquid oxygen quantity gage located in the aircraft, is incorporated within the container assembly. The quantity gage indicates the amount of LOX, in liters, contained in the converter.

6-6. FUNCTION.

6-7. Operational characteristics and performance for which the GCU-24/A converter assembly (P/N 29073-D2) are designed are as follows:

1. Filling the converter is accomplished by attaching the LOX servicing trailer filler valve to the filler port of the combination valve on the converter. When attached, the servicing trailer filler valve depresses the nosepiece and valve poppet of the combination valve. This automatically puts the converter into the fill mode (figure 6-2).

2. With the poppet depressed, fill and vent ports of the combination valve are opened and the buildup port is closed. This condition allows gas pressure built up in the inner container to vent to the atmosphere. As pressure is vented, LOX in the servicing trailer (which is at a greater pressure (30 psig)), flows through the combination valve and into the converter.

3. As the LOX level rises in the container, pressure created by vaporization of liquid due to heat, turbulence, etc, is vented to the atmosphere. The converter is considered full when LOX flows in a steady stream from the overboard vent line coupling assembly.

4. When the converter is full and the servicing trailer filler valve is disconnected, the nosepiece and poppet of the combination valve returns to the extended position (figure 6-3). This automatically puts the converter into the buildup and supply mode. In this mode the fill and vent ports are closed and the buildup port is open.

5. In the buildup and supply mode, LOX is forced out of the bottom of the inner container and into the buildup coil by the weight of the liquid (figure 6-3). As the LOX warms and vaporizes into gaseous oxygen in the buildup coil, pressure is created. This pressure is controlled at approximately 75 psig by the opening and closing action of the pressure closing valve.

6. Gaseous oxygen travels from the buildup coil through the supply coupling assembly and the heat exchanger to a shut-off valve in the aircraft cockpit.

7. Gaseous oxygen, under pressure, also passes through the gas and buildup parts of the combination valve to the upper portion of the pressure closing valve. A bellows, inside the pressure closing valve, holds the valve in the open position. As pressure builds, the bellows senses the increase, contracts (at approximately 75 psig) and closes the valve.

8. Without a demand being placed on the converter, pressure continues to slowly rise. If allowed to go unchecked, pressure in excess of 12,000 psig could be generated. To prevent this potentially hazardous situation, a relief valve is incorporated. The relief valve is set to relieve excess pressure in the converter assembly at approximately 110 psig.

9. As a demand is placed on the converter by the aircrewmember, LOX is forced into the buildup coil to replace consumed oxygen. As this process is repeated, the LOX level in the converter drops, increasing the void area at the top. As the size of the void area increases, pressure decreases, and is sensed by the bellows in the pressure closing valve. When pressure falls below approximately 75 psig, the bellows expands, opening the valve. With the valve open, pressure from the buildup coil passes through the valve and into the top of the converter. This pressure, coupled with the pressure created by vaporizing LOX contained in the converter, again builds to approximately 75 psig and closes the pressure closing valve. This process is repeated as long as a demand is being placed on the converter.

10. A heat exchanger is incorporated into the aircraft tubing to further warm the gaseous oxygen to a breathable temperature.

11. An additional relief valve, set at approximately 115 psig, is installed in the aircraft oxygen plumbing to provide additional protection against overpressurization of the converter and supply lines of the system.

6-8. SERVICE LIFE.

6-9. Liquid oxygen converters shall remain in service as long as they continue to function properly.

6-10. REFERENCE NUMBERS, ITEMS AND SUPPLY DATA.

6-11. Section 6-5, Illustrated Parts Breakdown, contains information on the converter assembly, subassemblies and component parts. Figure and index numbers, reference or part numbers, description, and units per assembly are provided with the breakdown.

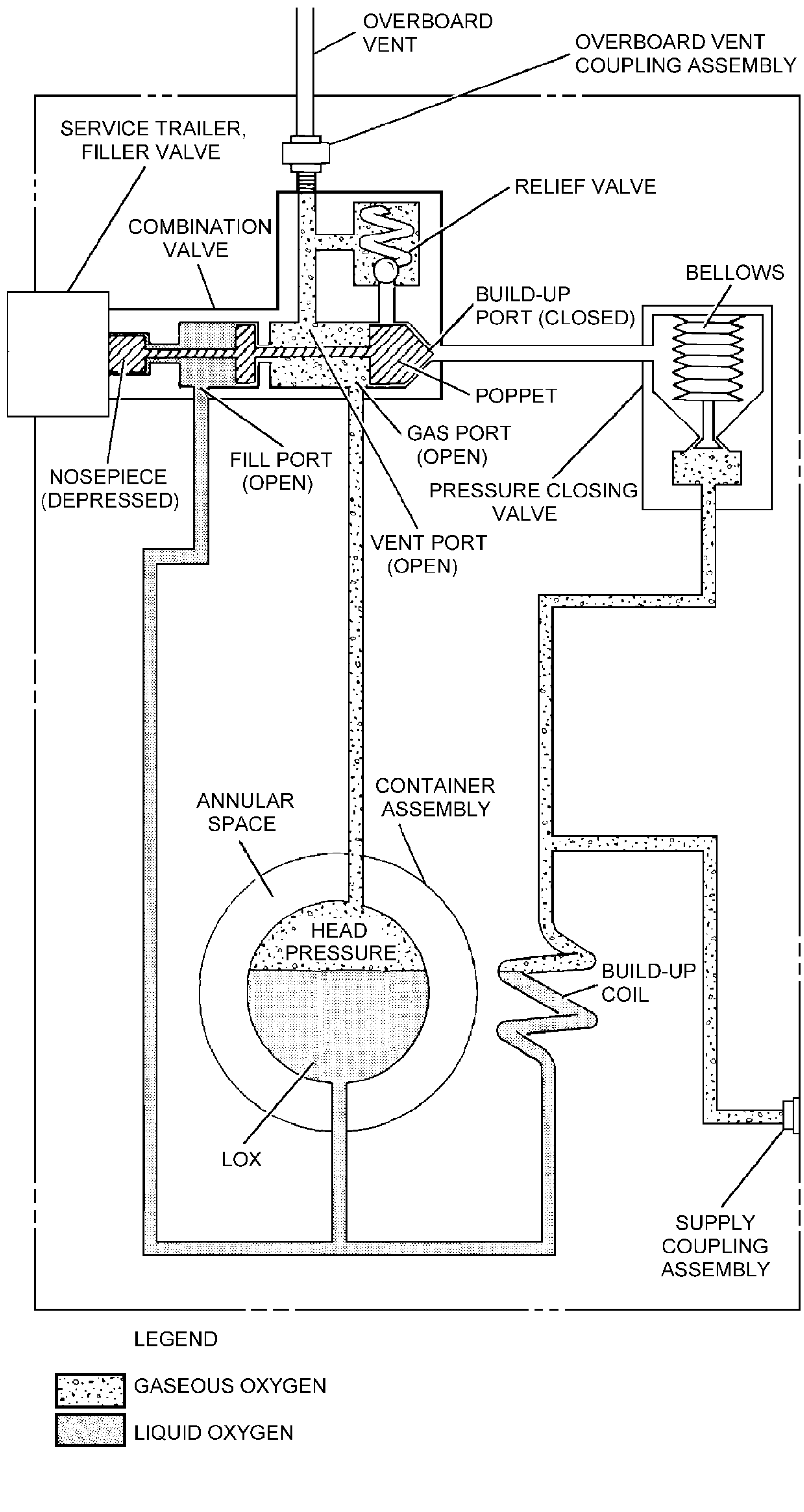


Figure 6-2. Fill Mode (Converter Removed from Aircraft)

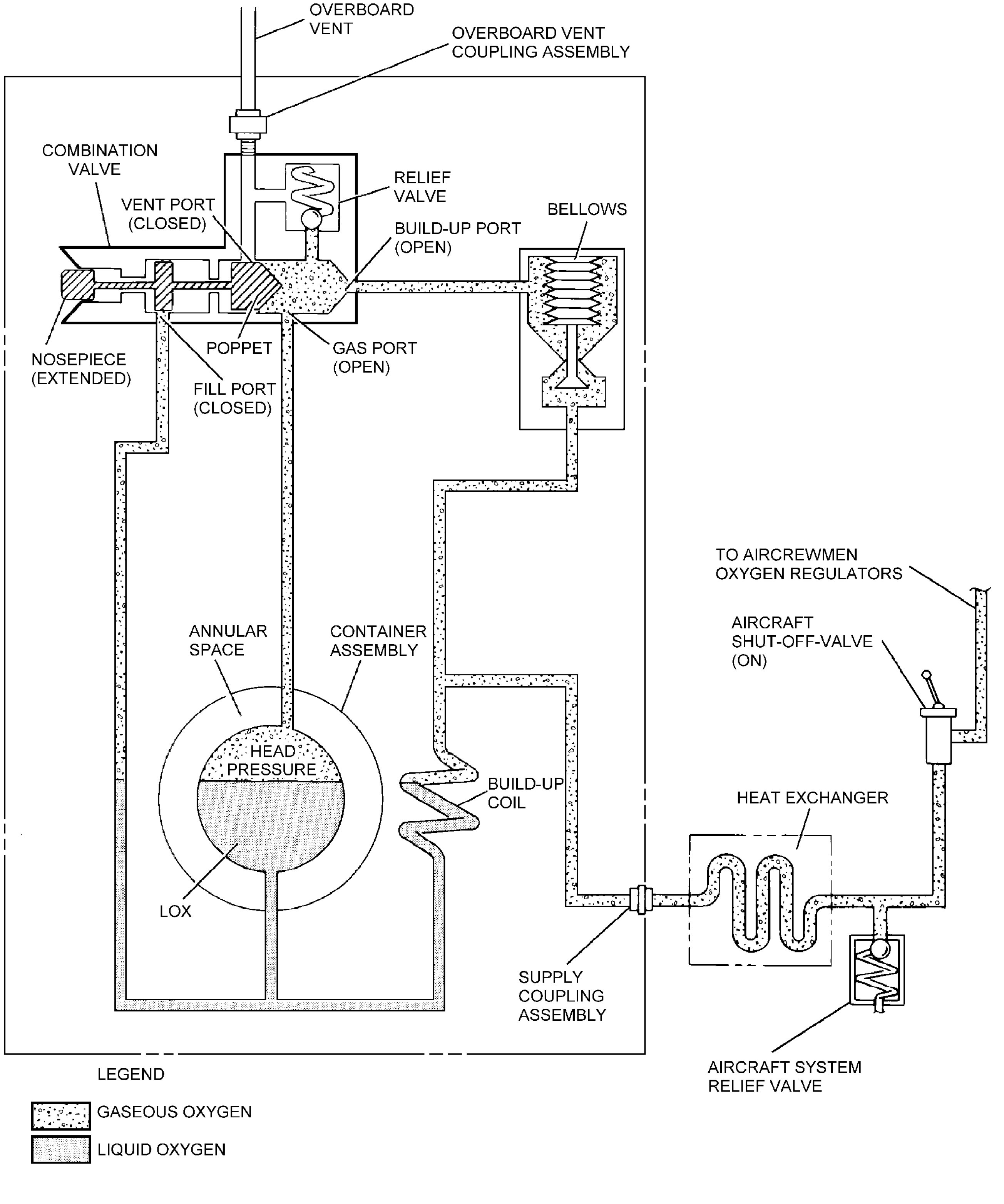


Figure 6-3. Buildup and Supply Mode (Converter Installed)

Section 6-2. Modifications

6-12. GENERAL.

6-13. There are no modifications to the GCU-24/A, (P/N 29073-D2) required/authorized at this time.

Section 6-3. Performance Test Sheet Preparation

6-14. GENERAL.

6-15. Preparation of the Liquid Oxygen Converter Performance Test Sheet utilized during bench test requires entering the appropriate indicated flows and pressures in the spaces provided (figure 6-4). The indicated flows and pressures shall be extracted from the test stand calibration correction cards. Refer to appropriate ground support equipment manual.

6-16. The test stand calibration correction cards contain all actual flows and pressures required to test all known models of liquid oxygen converters presently in service. Converting actual flows and pressures to indicated flows and pressures is normally accomplished during calibration of the test stand. Refer to appropriate ground support equipment manual for calibration intervals.

6-17. The Performance Test Sheets shall be prepared as shown in figure 6-4. The Performance Test Sheet shown is a sample but can be reproduced for local use.

6-18. The following tests require the extraction of appropriate indicated flows and/or pressures from the test stand calibration correction cards:

1. Converter Leakage Test
2. Relief Valve Test
3. Fill and Buildup Time Test
4. Flow Test
5. Converter Charge

NOTE

For correction card numbers refer to appropriate ground support equipment manual.

6-19. CONVERTER PERFORMANCE TESTS.

6-20. CONVERTER LEAKAGE TEST. The Converter Leakage Test is performed with the converter pressurized with gaseous oxygen to 95 psig. Locate the indicated psig for the actual 95 psig on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

6-21. RELIEF VALVE TEST. The relief valve shall vent at least 100 liters per minute (lpm) with an applied pressure of 100 to 120 psig. The maximum allowable leakage with 95 psig applied is 0.01 lpm. Make the following entries on the Performance Test Sheet:

1. Locate the indicated inches of water (inH_2O) for 100 lpm on correction card number 4. Enter indicated inH_2O in space provided on Performance Test Sheet.

2. Locate the indicated psig for the actual pressures of 85, 100 and 120 psig on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

3. Locate the indicated inH_2O for the actual flow of 0.01 lpm on correction card number 7. Enter the indicated inH_2O in space provided on Performance Test Sheet.

Performance Test Sheet
TYPE GCU-24/A LIQUID OXYGEN CONVERTER ASSEMBLY
(BENDIX CORPORATION P/N 29073-D2)

DATE: ____________ CONVERTER SERIAL NO: ____________ TEST STAND SERIAL NO: ____________

OPERATOR: ____________ CDI: ____________ TARE WEIGHT: ____________

1. CONVERTER PURGE (PURGE 30 MINUTES AT 200°F (93°C) TO 250°F (121°C) AND AT 120 PSIG).

2. INSULATION RESISTANCE TEST (EMPTY).

CONNECTION	MINIMUM ALLOWABLE MEGOHMS	READING
A TO B	2.0	
A TO GROUND	1.0	
B TO GROUND	1.0	

3. CAPACITANCE TEST (EMPTY) READING SHALL BE 121.5 TO 125.5 MICROMICROFARADS (UUF) ____________

4. RELIEF VALVE TEST

VENT FLOW						LEAKAGE					
INLET PRESS (PSIG)			FLOW			INLET PRESS (PSIG)			FLOW		
ACTUAL	INDICATED	PG-1 READING	ACTUAL (LPM)	INDICATED (INH_2O)	PG-2 READING	ACTUAL	INDICATED	PG-1 READING	ACTUAL (LPM)	INDICATED (INH_2O)	PG-2 READING
100			100			95			0.01		
120											

5. CONVERTER LEAKAGE TEST

95 PSIG ACTUAL = ____________ PSIG INDICATED, WITH INDICATED PSIG APPLIED THERE SHALL BE NO LEAKAGE FROM THE PRESSURE CONTROL VALVE, BUILDUP COIL, TUBING AND FITTINGS.

6. FILL AND BUILDUP TIME TEST

A. FILL TIME (MAXIMUM TIME ALLOWED IS 10 MINUTES) ____________

B. BUILDUP TIME (MAXIMUM TIME TO BUILDUP TO 55 TO 90 PSIG IS 5 MINUTES) PSIG ACTUAL = ________ PSIG INDICATED TIME REQUIRED FOR BUILUP ________ MINUTES.

7. CAPACITANCE TEST (FULL)

TOTAL CONVERTER WEIGHT	
CONVERTER TARE WEIGHT	
LOX WEIGHT (W)	
2.33 X W + 124.7 = C (MAX)	
2.25 X W + 122.3 = C (MIN)	
READING	
C = CAPACITANCE IN UUF	W = WEIGHT OF LOX IN POUNDS

Figure 6-4. Converter Performance Test Sheet (Sheet 1 of 2)

8. FLOW TEST (120 LPM WHILE MAINTAINING 55 TO 90 PSIG WORKING PRESSURE)

WORKING PRESS. (PSIG)		FLOW (LPM)		PG-2 READING
ACTUAL	PG-1 INDICATED	ACTUAL	INDICATED	
55		120		
90				

9. EVAPORATION LOSS TEST (BUILDUP AND SUPPLY MODE) MAXIMUM ALLOWABLE LOSS OF LOX IN 24 HOURS IS 3.0 LBS.

NOTE: LOX IN CONVERTER MUST BE STABILIZED FOR 1 HOUR PRIOR TO BEGINNING TEST. DO NOT AGITATE CONVERTER DURING 24 HOUR PERIOD.

A. START TIME ______________________ START WEIGHT ______________________

B. FINISH TIME ______________________ FINISH WEIGHT ______________________

10. EVAPORATION LOSS TEST (VENTED MODE)
MAXIMUM ALLOWABLE LOSS OF LOX IN 24 HOURS IS 5.0 LBS. (PERFORMED ONLY IF CONVERTER FAILS EVAPORATION LOSS TEST IN BUILDUP AND SUPPLY MODE)

A. START TIME ______________________ START WEIGHT ______________________

B. FINISH TIME ______________________ FINISH WEIGHT ______________________

11. CONVERTER CHARGE (OXYGEN)

PRESSURE (PSIG)		
ACTUAL	INDICATED	READING
25		
30		

Figure 6-4. Converter Performance Test Sheet (Sheet 2 of 2)

6-22. FILL AND BUILDUP TIME TEST. The time required to fill the converter (10 liters) shall not exceed 10 minutes at a filling pressure of 30 psig.

6-23. The time required for the filled converter to build up a working pressure of 55 to 90 psig shall not exceed 5 minutes from time the servicing trailer filler valve is disconnected from converter. Locate indicated psig for the actual psig pressure on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

6-24. FLOW TEST. The converter shall be capable of delivering gaseous oxygen at the rate of 120 lpm while maintaining pressure of 55 to 90 psig. Make the following entries on the Performance Test Sheet:

1. Locate the indicated inH_2O for the actual flow of 120 lpm on correction card number 4. Enter indicated inH_2O in space provided on Performance Test Sheet.

2. Locate the indicated psig for actual pressures of 55 to 90 psig on correction card number 2. Enter actual psig in spaces provided on Performance Test Sheet.

6-25. CONVERTER CHARGE. Upon completing the Bench Test, the converter shall be emptied of LOX and pressurized with gaseous oxygen 25 to 30 psig. This prevents moisture from entering the converter during shipment/storage. Locate indicated psig for the actual pressures of 25 and 30 psig on correction card number 2. Enter indicated psig in spaces provided on Performance Test Sheet.

Section 6-4. Maintenance

6-26. GENERAL.

6-27. This Section contains the procedural steps for inspecting, testing, troubleshooting, disassembly, cleaning, repair, assembly, and adjusting of the Liquid Oxygen Converter Assembly, Type GCU-24/A (P/N 29073-D2).

NOTE

Upon completion of any maintenance action (e.g., inspection, repair, modification, etc), be sure to complete the required Maintenance Data Collection System forms.

6-28. EMERGENCY PRESSURE RELIEF PROCEDURES. When filling the converter, or at any time, if any of the following situations are encountered: Heavy frosting, icing, or excessive pressure buildup (in excess of 130 psig), perform the following immediately.

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Fixture, Test, Valve, Gage/Relief, Pressure	Fabricate IAW figure 6-6
1	Line, Drain, Converter, LOX	Fabricate IAW figure 6-8
1	Line, Drain, Port, Vent	Fabricate IAW figure 6-7

WARNING

LOX in a non-vented container will build to 12,000 psig. Converters however, will explode at approximately 1,200 psig.

Do not attempt to relieve pressure in LOX converters that indicate critical overpressurization (figure 6-5). For these converters comply with procedures as prescribed in the individual station/ships emergency procedures bill.

1. Attach pressure gage/relief valve test fixture (figure 6-6) to supply quick-disconnect coupling (46).

2. Attach vent port drain line (figure 6-7) to converter coupling vent port coupling (40). Ensure vent port drain line faces away from operator.

3. Ensure adapter knurl knob is backed out counterclockwise.

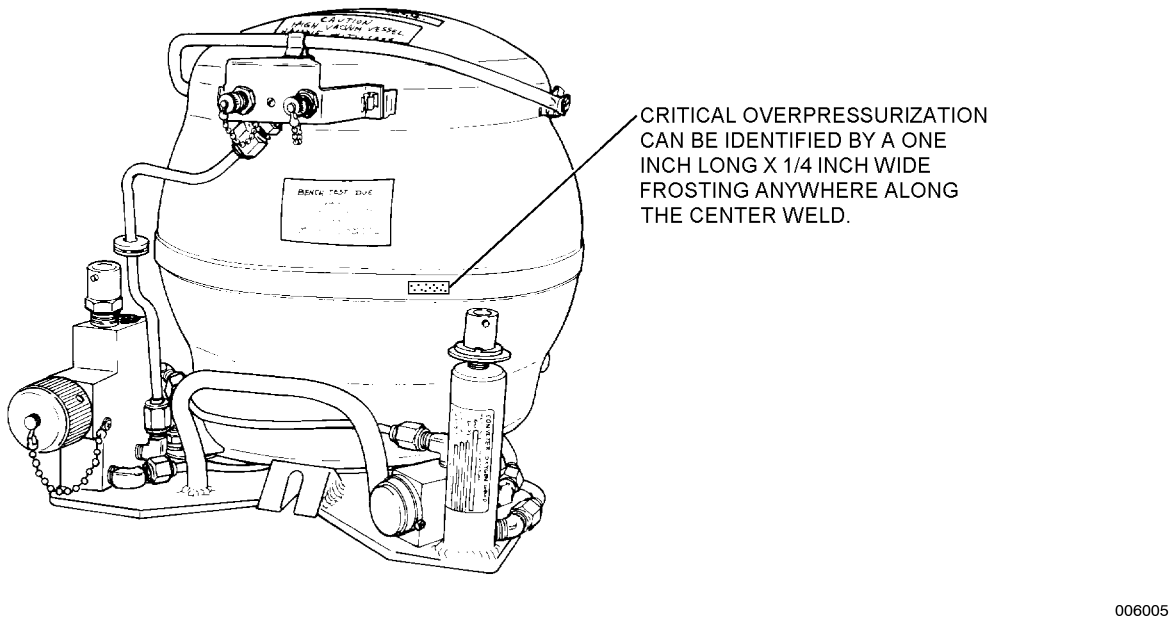


Figure 6-5. Critically Overpressurized Bendix LOX Converter, P/N 29073-D2

WARNING

When performing step 4, if excessive pressure does not relieve through vent port drain line, immediately comply with procedures as prescribed in the individual station/ships emergency procedures bill.

4. Install adapter to the fill port of fill, buildup, and vent valve (41) and relieve pressure from the converter by turning the knurl knob of the adapter clockwise four full turns (this places the converter in the vented mode).

5. Observe the pressure gage/relief valve test fixture until 70 psig is indicated.

6. Remove pressure gage/relief valve test fixture and adapter.

WARNING

When performing step 7, if LOX fails to drain from the converter, disconnect LOX converter drain line, attach adapter to fill, buildup, vent valve (41) and turn knurl knob clockwise 4 full turns. (Organization Level transport defective converter to AIMD immediately.)

7. Immediately place converter in a LOX drain pan, attach LOX converter drain line (figure 6-8) to supply quick-disconnect coupling (46) and drain LOX from the converter.

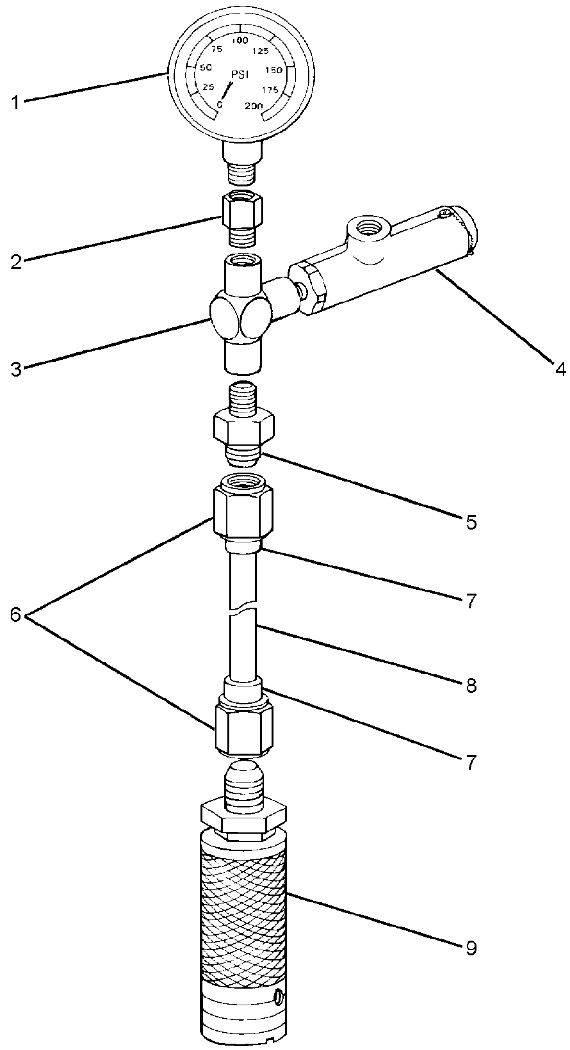
8. Organizational level forward the defective LOX converter to AIMD for bench test.

6-29. INSPECTION.

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical over-pressurization, immediately comply with the emergency pressure relief procedures given in paragraph 6-28 at the beginning of this section.

6-30. ACCEPTANCE/TURNAROUND/DAILY/PREFLIGHT/POSTFLIGHT AND TRANSFER INSPECTIONS. The Acceptance/Turnaround/Daily/Preflight/Postflight and Transfer Inspections consist of a Visual Inspection followed by a Functional Test. These inspections and tests shall be performed in conjunction with the aircraft inspection requirements for the aircraft in which the converter is installed. Refer to table 6-2 for troubleshooting assistance.



ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY INSTRUCTIONS
1	200 PSIG Oxygen Gage	P/N 100204-18 (CAGE 42527) NIIN 00-961-1990	Anti-seize tape required (Note 1)
2	1/4 to 1/8 in. Reducer, Pipe	P/N 3200X4X2 (CAGE 79470)	Anti-seize tape required
3	Pipe Tee	AN917-1	—
4	Relief Valve	P/N 20C-0005-20 (CAGE 19062) MIL-V-9050D P/N 20C-0050-2	Adjust to relieve at 135 ± 5 psig and flow a minimum of 100 lpm. (Note 1) Anti-seize tape required
5	Male Connector	AN816-5D	Anti-seize tape required
6	Tubenut	AN818-5	2 required
7	Tube Sleeve	MS20819-5	2 required
8	Flared Aluminum 6061-T6 Tube (5/16″ O.D. Dia)	—	Cut length 2 1/2 to 3 1/2 in.
9	Supply Quick-disconnect Coupling	MS22608-7 P/N 199000-1 (CAGE 83533)	—

Notes: 1. The Pressure Gage/Relief Valve Test Fixture shall be forwarded to AIMD for relief valve setting, flow test, and leakage test (same as converter relief valve test only higher setting). The 200 PSI Oxygen Gage shall be calibrated in accordance with the metrology and calibration (METCAL) program.

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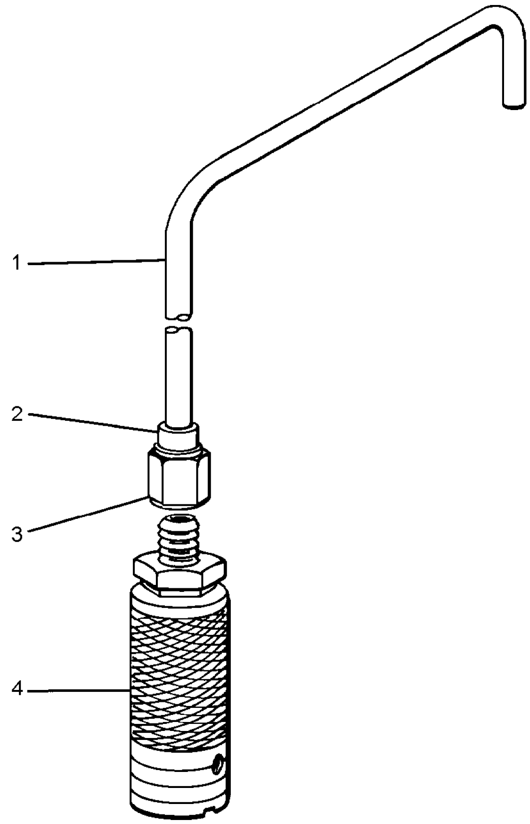
Figure 6-6. Pressure Gage/Relief Valve Test Fixture



ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY INSTRUCTIONS
1	Flared Aluminum 6061-T6 Tube (1/2 O.D. Dia)	—	Cut to 14-inches; bend as shown above
2	Tube Sleeve Coupling	MS20819-8	—
3	Tubenut	AN818-8	—
4	Half Coupling Quick-disconnect	2560000-1 (CAGE 83533)	—

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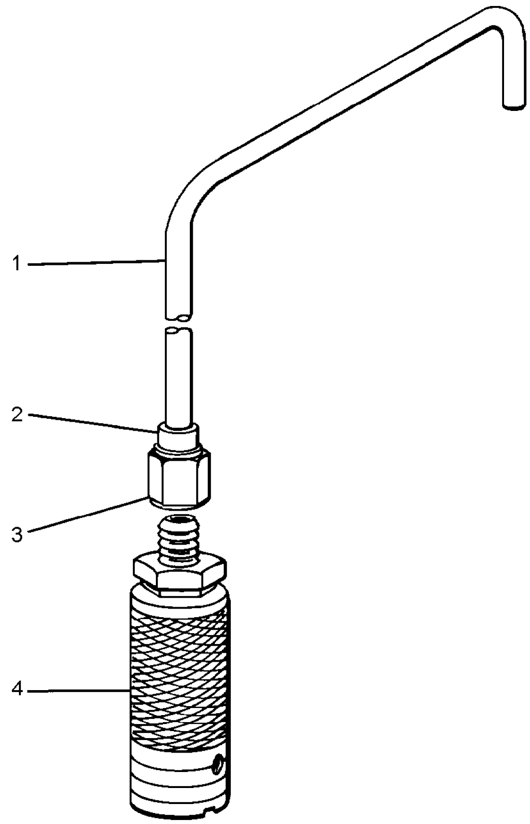
Figure 6-7. Vent Port Drain Line



ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY INSTRUCTIONS
1	Flared Aluminum 6061-T6 Tube (5/16″ O.D. Dia)	—	Cut to 15-inch length; bend as desired
2	Tube Sleeve	MS20819-8	—
3	Tubenut	AN818-5	—
4	Quick-disconnect Coupling	MS22068-7 P/N 199000-1 (CAGE 83533)	—

006008

Figure 6-8. LOX Converter Drain Line

Table 6-2. Troubleshooting (Acceptance/Turnaround/Daily/Preflight/Postflight and Transfer Inspections)

Trouble	Probable Cause	Remedy
Converter will not fill.	Ice in filler valve or filler obstructs LOX flow.	Thaw filler valve or filler line.
Converter does not fill in required time.	Filler line not properly purged prior to filling.	Purge and cool filler line.
	Converter not sub-cooled before filling.	Lower pressure in servicing trailer and sub-cool converter.
	Filling pressure too low.	Set fill pressure in accordance with servicing trailer operating instructions.
	Defective converter.	Replace converter with RFI converter.
Frost collects on entire outer jacket of converter.	Heat loss due to annular space leakage.	Replace converter with RFI converter.
Converter will fill only partially (gas only emitted from vent).	Converter not sub-cooled prior to filling.	Lower pressure in servicing trailer and sub-cool converter.
System will not build up.	Combination valve defective or partially open.	Replace converter, or thaw valve.
	Pressure relief valve open.	Replace converter with RFI converter.
Oxygen supply consumed too quickly.	Converter not completely filled during filling operation.	Refill converter.
	System leakage.	Locate and repair leaks.
	Combination valve partially open, venting gas.	Replace converter with RFI converter.
Filler line cannot be disconnected from filler valve.	Filler nozzle frozen to filler valve.	Thaw nozzle.
Low or no system pressure.	System leakage.	Locate and repair leaks.
	Pressure closing valve out of adjustment.	Replace converter with RFI converter.
Quantity gage indicates empty.	System empty; defective probes or gage.	Refill converter; replace converter or gage.
LOX system contaminated.	Undesirable odors, or moisture.	Purge system.

NOTE

Fill the converter in accordance with paragraph 6-48; ensuring strict compliance with all steps, especially steps 5 and 6.

6-31. Any liquid oxygen converter which does not pass the Visual Inspection or Functional Test shall be removed from the aircraft, drained immediately, and replaced by a Ready For Issue (RFI) liquid oxygen converter. To drain the liquid oxygen converter, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Line, Drain, Converter, LOX	Fabricate IAW figure 6-8

NOTE

If no LOX converter drain line is available, fabricate one in accordance with figure 6-8.

1. Place converter in a LOX converter drain pan in an area free from dirt and hydrocarbons.

WARNING

Ensure that draining LOX is directed away from all personnel.

2. Attach drain line (figure 6-8) to converter supply quick-disconnect coupling, which will immediately begin draining converter.

3. Contact Maintenance Control for action to be taken.

6-32. Visual Inspection. Visually inspect the converter assembly and surrounding area for the following:

WARNING

When working with oxygen, make certain that clothing, tubing fittings, and equipment are free of oil, grease, fuel, hydraulic fluid, or any combustible liquid. Fire or explosion can result when even slight traces of combustible material come in contact with oxygen under pressure.

1. Freedom from dirt and hydrocarbons.

2. Correct installation and positioning of all components.

3. Legibility of all markings.

4. Cracks, dents, or other damage to tubing, valves, and electrical connections.

5. Corrosion on converter assembly and surrounding areas.

6. Obstructions in aircraft overboard vent line.

7. Security of supply, vent and electrical quick-disconnect.

8. Excessive frosting and/or continuous venting of converter assembly.

9. Ensure date on converter bench test decal is current. (Within last 231 days.)

6-33. Functional Test. To functionally test the converter assembly and aircraft oxygen system, proceed as follows:

NOTE

The Functional Test should also be performed whenever a component of the aircraft oxygen system is removed/replaced.

1. Ensure all circuit breakers associated with the LOX quantity indicating system are set.

NOTE

External electrical power must be applied to the aircraft to perform steps 2 and 3.

Refer to applicable aircraft Handbook of Maintenance Instructions (HMI) to determine at what quantity (indicated on quantity gage) that low warning light should illuminate.

2. Depress oxygen test switch. Check quantity gage and low warning light for proper operation.

3. Release test switch. Ensure gage pointer returns to position registered on gage before depressing. When test is completed, disconnect electrical power from aircraft.

4. Ensure oxygen shut-off valve is in the OFF position.

5. Attach an oxygen mask, regulator, and regulator to-seat kit hose assembly to oxygen supply connection in aircraft.

6. Turn oxygen shut-off valve to the ON position. There should be a flow of oxygen through the mask.

NOTE

Resistance during exhalation is due to the positive pressure feature of the regulator.

7. Place mask against face and breathe. There should be a slight resistance during exhalation.

8. Upon completion of functional test, turn oxygen shut-off valve to OFF. Disconnect regulator-to-seat kit hose from aircraft supply connection.

6-34. If discrepancies are found or suspected, Maintenance Control shall be notified.

6-35. Components of the aircraft oxygen system which do not pass inspection and cannot be repaired in the aircraft shall be removed and replaced by Ready For Issue (RFI) components. Forward defective components to AIMD for bench test.

6-36. CALENDAR INSPECTION. The Calendar Inspection shall be performed on all liquid oxygen converters that incorporate a quick-disconnect mounting plate prior to placing in service, and at intervals not exceeding 231 days thereafter. This interval applies to all converters; aircraft-installed, shop spares, and those maintained in a servicing pool.

6-37. The Calendar Inspection consists of a Visual Inspection followed by a Bench Test. All work shall be performed in a clean, dust-free and oil-free area. Converter assemblies found to be damaged or out of adjustment shall be repaired by replacing or adjusting the discrepant part or parts. After repair, repeat the Bench Test.

NOTE

Liquid oxygen converters new from supply, manufacture, or from NARF overhaul do not require the bench test decal. The bench test decal shall be placed on the converter by the local AIMD when the converter is placed in service and after each Bench Test.

6-38. Visual Inspection. Inspect the converter assembly in accordance with table 6-3.

6-39. Liquid oxygen converters failing the Visual Inspection or Bench Test (paragraph 6-40) shall be repaired. Further explanation is found in Naval Aviation Maintenance Program Manual, OPNAVINST 4790.2 Series.

6-40. BENCH TEST.

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical over-pressurization, immediately comply with the emergency pressure relief procedures given in paragraph 6-28 at the beginning of this section.

NOTE

Some inservice liquid oxygen converter test stands that bear part numbers other than those mentioned in paragraph 6-41 still exist. Use of these test stands is authorized provided they are capable of monitoring converter performance as specified in the bench test.

6-41. The Bench Test shall be performed using Liquid Oxygen Converter Test Stand P/Ns 59A120, 31TB19951, 1455AS100-1, or 31TB1995-4. Refer to appropriate ground support equipment manual for identification of test stand controls and indicators referenced in Bench Test procedures. Do not attempt to perform any Bench Test without first becoming thoroughly familiar with the test stand (refer to appropriate ground support equipment manual). Utilize Performance Test Sheet (figure 6-4) when performing Bench Test.

Table 6-3. Visual Inspection of Type GCU-24/A Liquid Oxygen Converter, P/N 29073-D2

Part Nomenclature	Index Number	Inspect For	Remedy
Note: Index numbers in this table refer to figure 6-11.			
Identification and performance plates.	-35 and -48	Legibility, condition and security.	Secure in place, or replace.
Warning and bench test decals.	-34 and -49	Presence and condition.	Replace or apply as required.
Handle.	-29	Bends and cracks.	Replace.
Tubing assemblies.	-6, -7, and -36	Cracks, dents, nicks, scratches, twists and proper clearance. Damaged connectors and tube nuts.	Replace damaged tubing assemblies and connectors. Tubing may be slightly bent to maintain a minimum 1/16-inch clearance between other converter components.
Elbows and nipples.	All.	Cracks, dents and scratches.	Replace.
Male coupling assemblies.	-40 and -46	Visible damage.	Replace.
Shocks mounts and cup-shock pads.	-27 and -28	Security and condition.	Replace.
Combination valve.	-41	Cracks, damaged poppet valve, nosepiece or worn helical grooves.	Replace.
Clamps.	-38	Security and condition.	Tighten or replace.
Pressure closing valve.	-44	Cracks or other visible damage.	Replace.
Mounting pad assembly.	-50	Cracks, broken welds, or other visible damage.	Replace damaged components.
Container assembly.	-8	Excessive dents, chipped paint or other damage.	Refer to paragraph 6-63 for size of acceptable dents. Restore finish by painting (paragraph 6-63).
Converter assembly.	No Index.	Freedom from dirt, hydrocarbons and corrosion.	Clean (paragraph 6-59) and/or refinish (paragraph 6-63).

WARNING

When working with oxygen, make certain that clothing, tubing fittings, and equipment are free of oil, grease, fuel, hydraulic fluid, or any combustible material. Fire or explosion can result when even slight traces of combustible material come in contact with oxygen under pressure.

Prior to use, inspect leak detection compound. Compound which is not clear and free from suspended material/sediment is considered contaminated and shall be disposed of. Compound exhibiting peculiar odors such as acetone or alcohol is considered contaminated and shall be disposed of.

When using leak detection compound carefully avoid getting it on Probe Wire connections as moisture will cause incorrect capacitance/insulation reading.

NOTE

Tests are arranged so that they proceed from one test to the next with a minimum of flow changes. Troubleshooting tables are provided following each test.

6-42. TARE WEIGHT. To find the Tare Weight of the complete converter assembly, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

NOTE

Tare Weight is the weight of the complete converter assembly less the weight of the LOX.

1. Ensure all LOX has been removed from the converter.

2. Place converter assembly on scale of at least 50-lb capacity. Record weight in space provided on Performance Test Sheet.

6-43. CONVERTER ASSEMBLY PURGE. To purge the Converter Assembly, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Nitrogen, Oil-free, Water Pumped, Type I, Class I, Grade B	Fed Spec BB-N-411 NIIN 00-985-7275

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Coupling, Quick-disconnect, Half	256000-1 MS22068-8 (CAGE 83533)
1	Expander, Thread, Screw, Bushing	AN894-8-4
1	Purging Unit, Gas/LOX, Model A/M26M-3	3447AS100-1

WARNING

Use only oil-free nitrogen, Type I, Class 1, Grade B for purging LOX converters.

Purging unit model A/M26M-3 has two specially designed 3500 psig nitrogen cylinders. Do not substitute these cylinders with other nitrogen cylinders such as NAN cart cylinders.

While operating purging unit A/M26M-3, protective gloves must be worn by operator. Discharge fittings and hoses can reach temperatures that will cause burns if grasped with bare hands.

NOTE

Personnel operating purging unit model A/M26M-3 should be thoroughly familiar with all valves and controls prior to operating. Refer to appropriate support equipment manual. Personnel operating purging unit model A/M26M-3 shall be licensed in accordance with OPNAVINST 4790.2 Series.

Liquid oxygen converters shall be emptied of all LOX and allowed to warm to ambient temperature prior to purging.

Index numbers in parentheses for LOX converter assembly, refer to figure 6-12.

Index numbers for purging unit model A/M26M-3, refer to figure 6-9.

1. Remove two supply lines (14) from purge unit cabinet. Connect one end of each supply line (14) to nitrogen supply cylinders and the other ends to the supply inlet connections (22) of purge unit.

2. Remove insulated hose (15) from purge unit cabinet. Connect quick-disconnect (18) of insulated hose (15) to system (A) quick disconnect (19) of purge unit.

3. Screw boss to pipe fitting onto quick-disconnect coupling and attach to B-nut (23) of insulated hose (15).

4. Turn purge unit 3-way valve (20) to system (A) position.

5. Ensure power switch (5) is OFF.

6. Remove power cable (17) from purge unit cabinet and plug into 110 volt outlet.

7. Open both nitrogen supply cylinder valves.

8. Open hand shutoff valves (1) and (3). High pressure gage (4) will indicate nitrogen supply cylinder pressure.

9. Connect quick-disconnect coupling, attached to insulated hose (15), to LOX converter vent port of fill, build up, and vent valve (43).

10. Attach adapter to fill port of LOX converter fill, build up, and vent valve (43). Turn knurl knob of adapter clockwise until it seats, then back off counterclockwise two (2) full turns. This will place the fill, build up, and vent valve half way between the fill/vent and build up/vent modes.

11. Attach LOX converter drain lines (figure 6-8) to LOX converter supply quick-disconnect coupling (16).

12. Turn power switch (5) to ON position. Power on light (6) should illuminate.

13. Turn pressure regulator (11) clockwise until 120 psig is indicated on low pressure gage (2).

NOTE

For LOX converters that show indications of internal probe short, it may be necessary to purge the converter for a longer period of time when performing step 14.

14. Observe heater on light (7). When light cycles from on to off, purge the converter for 30 minutes, with a minimum discharge temperature of 90°F.

15. When purging is completed, turn purging unit power switch (5) to off.

16. Close nitrogen supply cylinder valves.

17. Observe low pressure gage (2) and high pressure gage (4) until they indicate 0 psig. Back out counterclockwise on pressure regulator (11).

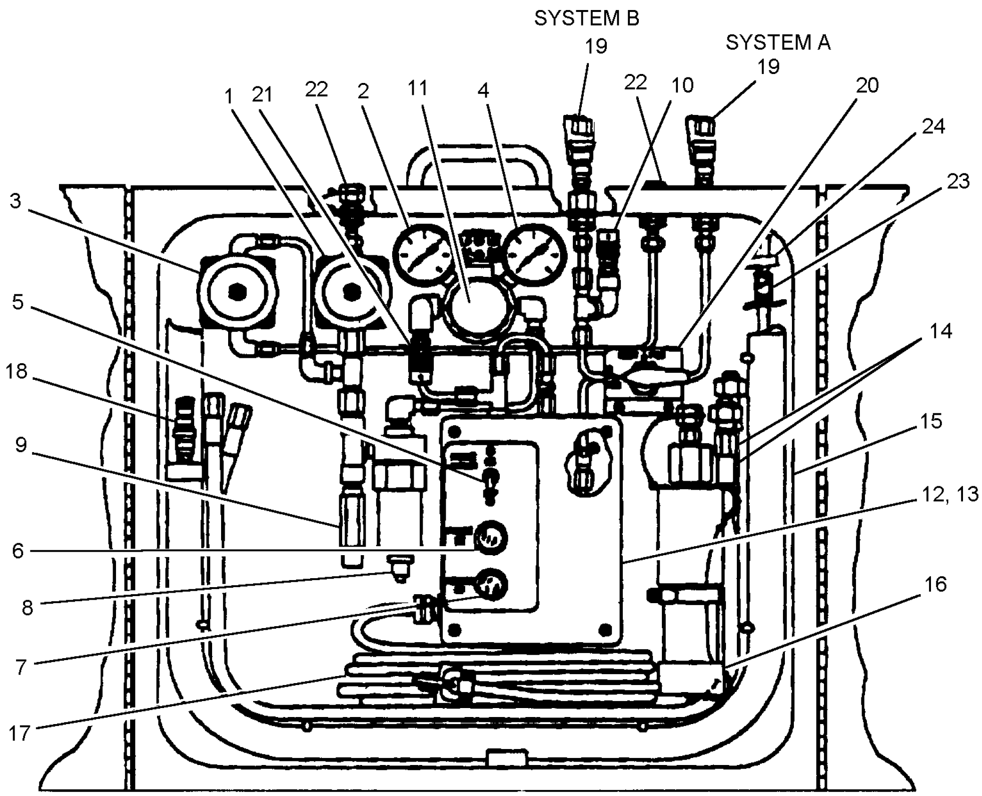
18. Close hand shutoff valves (1) and (3).

19. Disconnect insulated hose (15) from LOX converter vent port fitting of fill, build up, and vent valve (43) and purging unit system (A) quick disconnect (19).

20. Remove drain lines (figure 6-8) from LOX converter supply quick-disconnect coupling (16).

21. Remove adapter from filler port of fill, build up, and vent valve (43).

22. Stow all lines and accessories and secure from purging.



Description	Function
1. Hand Shutoff Valve	Controls Supply Gas Flow
2. Low Pressure Gage	Indicates Delivery Gas Pressure (0-200 PSIG)
3. Hand Shutoff Valve	Controls Supply Gas Flow
4. High Pressure Gage	Indicates Supply Gas Pressure (0-4000 PSIG)
5. Power Switch	Master On/Off Switch/Circuit Breaker
6. Power On Light	Indicates Master Switch is On and Set is Operational
7. Heater On Light	Indicates Operation of Heater
8. Priority Valve	Stops Gas Flow When Supply Gas Pressure Falls Below 200 PSIG
9. Relief Valve	Relieves Supply Pressure Exceeding 3750 PSIG
10. Low Pressure Relief Valve	Relieves Service Line Supply Pressure Exceeding 705 PSIG
11. Pressure Regulator Assembly	Regulates Pressure to 0-200 PSIG
12. Temperature Control Switch (Under Plate)	Cycles Off and On to Control Exit Gas
13. High Temperature Shutdown (Under Plate)	Shuts Off Heater when Heater Block Temperature Reaches 285°F
14. Supply Line	Connects Supply Cylinders to Housing Assembly
15. Insulated Hose Assembly	Connects Housing Assembly
16. Filler Valve	Connects Insulated Hose Assembly to Converter
17. Power Cable	Connects Unit to Electrical Power
18. Quick Disconnect	Connects Insulated Hose to 19 System A or B
19. Quick Disconnect	Connection for Insulated Hose to 19 System A or B
20. 3-Way Valve	Selects A or B Outlet Ports
21. High Pressure Relief Valve	Relieves Service Line Supply Pressure Exceeding 1355 PSIG
22. Supply Pressure Inlet	Connects Supply Line 14 to Purge Unit
23. B-Nut	Connects Insulated Hose to Filler Valve 16 or Adapter (Not Shown)
24. Adapter	Connects Insulated Hose to P-3 Aircraft Filler Port

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Figure 6-9. A/M26M-3 Purging Unit

6-44. INSULATION RESISTANCE TEST (EMPTY). To perform the Insulation Resistance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Prior to proceeding, it should be noted that the minimum acceptable megohm readings have been changed as follows. A to B, 2.0 megohms; between A to ground to B to ground the reading shall not be less than 1.0 megohm. These readings are acceptable as long as the converter passes the Capacitance Test (Empty) and Capacitance Test (Full).

1. Secure empty converter in rack provided on test stand counter top.

2. Using test stand cable assembly, connect converter probe assembly electrical connectors (17 and 18) to terminals marked A and B of liquid oxygen quantity gage capacitance type tester.

3. Turn power switch ON and allow tester to warm up 10 minutes prior to proceeding.

4. Turn MEGOHMMETER RANGE SELECTOR to X-1 position.

5. Turn FUNCTION SELECTOR knob to A to B position. Record reading in space provided on Performance Test Sheet. Reading should not be less than 2.0 megohms.

6. Turn FUNCTION SELECTOR knob to A TO GROUND and B TO GROUND positions, respectively. Record readings in spaces provided on Performance Test Sheet. Readings shall not be less than 1.0 megohm in either position.

NOTE

If insulation resistance readings are within the minimum acceptable megohm requirements, proceed to Capacitance Test (Empty).

If insulation resistance readings are less than the minimum acceptable megohm requirements, moisture may still be present in container assembly; proceed to step 7.

7. Purge converter in accordance with paragraph 6-43 and repeat Insulation Resistance Test (Empty).

NOTE

Converter assemblies that fail the Insulation Resistance Test and cannot be corrected by purging shall be forwarded to the next higher maintenance repair facility.

8. Leave all connections unchanged.

6-45. CAPACITANCE TEST (EMPTY). To perform the Capacitance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Turn CAPACITANCE RANGE SELECTOR knob to X-10 position.

2. Turn FUNCTION SELECTOR knob to CAPACITANCE (UUF) position.

3. Record reading in space provided Performance Test Sheet. Reading shall be 12 micromicrofarads (μμF).

NOTE

If reading is acceptable, proceed to step 5.

If reading is not within 121.5 to 125.5 micro-microfarads, moisture may still be present within the container assembly, proceed to step 4.

4. Purge converter in accordance with paragraph 6-43, and repeat Capacitance Test (Empty).

NOTE

Converter assemblies that fail the Capacitance Test and cannot be corrected by purging shall be forwarded to the next higher maintenance repair facility.

5. Secure power to tester and disconnect test stand cable assembly from converter and test stand.

6-46. CONVERTER LEAKAGE TEST. To perform the Converter Leakage Test, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	Hose Assembly, Stand, Test	59A120-B5-14

Support Equipment Required (Cont)

Quantity	Description	Reference Number
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Index numbers in parentheses refer to figure 6-12.

1. Disconnect converter cap assembly (1) from tee fitting (2). Using test stand hose assembly, connect test stand BELL JAR BOTTOM COUPLING (C-1) to tee fitting (2).

2. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

3. Utilizing OXYGEN SUPPLY valve (V-6) apply 95 psig, as indicated on TEST PRESSURE gage (PG-1) to converter.

4. Maintain 95 psig and inspect for leakage at all connections, using leak detection compound. There is no allowable leakage. If leakage is indicated, locate probable cause using troubleshooting chart, table 6-4.

Table 6-4. Troubleshooting (Converter Leakage Test)

Trouble	Probable Cause	Remedy
Any fitting connection leaking.	Loose connection.	Tighten connection.
Elbow or nipple fitting leaking.	Stripped threads, excessive burrs, deep scratches, inside or outside diameter out of round or loose.	Retighten or replace fitting(s).
Tubing leaking.	Dents, kinks, deep scratches, twisted tubing, improperly flared ends or damaged connectors.	Replace tubing.

5. Close OXYGEN SUPPLY valve (V-6). Leave all valves and connections unchanged and proceed to Relief Valve Test.

6-47. RELIEF VALVE TEST. To perform the Relief Valve Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Hose Assembly, Stand, Test	59A120-B5-14
1	Hose Assembly, Stand, Test	59A120-B5-52
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Index numbers in parentheses refer to figure 6-12.

1. Ensure test stand hose assembly (P/N 59A120-B5-14), connecting BELL JAR BOTTOM COUPLING (C-1) to tee fitting (2) is in place.

2. Using test stand hose assembly (P/N 59A120-B5-52), connect converter coupling assembly (40) to test stand FLOWMETER connection (NIP-4).

3. Ensure TEST PRESSURE GAGE-TO-BELL JAR valve (V-2), is open. Turn FLOWMETER SELECTOR valve (V-1) to the 0-150 lpm position.

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly and observe TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2) when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

4. Slowly open OXYGEN SUPPLY valve (V-6) until 100 lpm flow is indicated on FLOWMETER INDICATOR gage (PG-2).

5. With 100 lpm indicated on FLOWMETER INDICATOR gage (PG-2) reading on TEST PRESSURE gage (PG-1) shall be 100120 psig. Record reading from TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2) on Performance Test Sheet.

6. Using OXYGEN SUPPLY valve (V-6), and SYSTEM BLEED valve (V-5) reduce pressure applied to converter to 95 psig as indicated on TEST PRESSURE gage (PG-1).

7. Disconnect test stand hose (P/N 59A120-B5-52) from FLOWMETER connection (NIP-4).

CAUTION

When attaching test stand hose (P/N 59A120-B5-52) to FLOWMETER connection (NIP-1) attach slowly while observing FLOWMETER INDICATOR gage (PG-2) excessive relief valve leakage could damage FLOWMETER INDICATOR gage (PG-2).

8. Turn FLOWMETER SELECTOR valve (V-1) to the 0.0-0.25 lpm position and slowly connect test stand hose (P/N 59A120-B5-52) to FLOWMETER connection (NIP-1).

9. While maintaining 95 psig to the converter with valve (V-6), check for leakage indicated on FLOWMETER INDICATOR gage (PG-2). Maximum allowable leakage is 0.01 lpm. Record reading on Performance Test Sheet.

10. If leakage is excessive or if relief valve fails to vent at required flow and pressure, locate probable cause using troubleshooting chart, table 6-5.

Table 6-5. Troubleshooting (Relief Valve Test)

Trouble	Probable Cause	Remedy
Relieving below 100 psig.	Relief valve out of adjustment.	Adjust relief valve (paragraph 6-70, step 21).
Relieving above 120 psig.	Relief valve out of adjustment.	Adjust relief valve (paragraph 6-70, step 21).
Relief valve fails to vent 100 lpm.	Relief valve out of adjustment.	Adjust relief valve (paragraph 6-70, step 21).
Leakage in excess of 0.01 lpm.	Relief valve out of adjustment.	Adjust relief valve (paragraph 6-70, step 21).
Relief valve cannot be adjusted to tolerances.	Defective parts.	Replace defective parts.

11. Close OXYGEN SUPPLY valve (V-6). Bleed test stand using SYSTEM BLEED valve (V-5). Close TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

12. Disconnect test stand hose assemblies (P/Ns 59A120-B5-14 and 59A120-B5-52) from converter and from test stand.

13. Replace converter cap assembly (1) on tee fitting (2).

14. Remove converter assembly from test stand.

6-48. FILL AND BUILDUP TIME TEST. To perform the Fill and Buildup Time Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Fixture, Test, Valve, Gage/Relief, Pressure	Fabricate IAW figure 6-6
1	Line, Drain, Port, Vent	Fabricate IAW figure 6-7

WARNING

Because of the extreme low temperature of LOX, use extreme care at all times when handling LOX. Ensure that prescribed protective clothing is worn, and all safety precautions are observed (Chapter 3).

Ensure venting LOX is directed away from all personnel in the area.

NOTE

Personnel servicing LOX converters and operating LOX transfer equipment shall be qualified and licensed in accordance with OPNAVINST 4790.2 Series.

To perform this test, it will be necessary to take the converter to a LOX servicing area or use a LOX servicing trailer in the immediate area of the Oxygen Shop. Any other method is acceptable that meets requirements of the test and does not violate safety precautions outlined in Chapter 3.

1. Connect the converter to the servicing trailer.

NOTE

If servicing trailer being used is not the closed loop type, attach a vent port drain line (figure 6-7) to the vent port coupling (40). Ensure vent port drain line is attached to route venting LOX away from all personnel.

2. Note the time, and fill the converter, following applicable instructions for specific ground support equipment servicing trailer being used.

3. When the converter is full, note the time. Time required to fill the converter shall not exceed 10 minutes. Record fill time in space provided on Performance Test Sheet.

4. Note the time, and disconnect and secure the servicing trailer and remove the vent port drain line if installed. Time noted is beginning of Buildup Time Test.

NOTE

The test pressure gage relief valve test fixture shall be forwarded to the Intermediate Maintenance activity every 6 months for pressure gage calibration and relief valve adjustment and leakage test.

5. Immediately after servicing, attach pressure gage/relief valve test fixture (figure 6-6) to converter supply quick-disconnect coupling (16) and observe for 5 minutes; the following actions should occur:

a. The converter should begin to build head pressure as indicated on the pressure gage/relief valve test fixture. Initially the converter will build a pressure that will cause the LOX converter relief valve to relieve (110 to 120 psig). This action may occur twice.

WARNING

When performing step 5b, if pressure fails to stabilize, drain the LOX converter and forward to Intermediate Level maintenance.

b. After step 5a occurs, pressure indication on the pressure gage/relief valve test fixture should stabilize at LOX converter pressure closing valve setting of 55 to 90 psig (a slight fluctuation of 2 to 3 psig on the pressure gage/relief valve test fixture will be present).

6. Disconnect pressure gage/relief valve test fixture from supply quick-disconnect coupling.

7. If converter fails to build head pressure, converter relief valve fails to relieve between 110 to 120 psig, or converter fails to stabilize between 55 to 90 psig, refer to troubleshooting chart (table 6-6).

Table 6-6. Troubleshooting (LOX Converter After Servicing)

Trouble	Probable Cause	Remedy
Converter fails to build head pressure.	Converter fill, buildup, and vent valve failed to return to build-up and supply mode.	Foward converter to AIMD for purge or valve replacement and Bench Test. Drain converter by removing tube assembly (index number 6, figure 6-12). Place converter upside down in drain pan and allow to drain by gravity flow process.
Converter relief valve fails to relieve between 110 to 120 psig.	Converter relief valve out of adjust ment or defective.	Forward converter to AIMD for relief valve adjustment or replacement and Bench Test.
Converter pressure continues to build and will not stabilize.	Converter pressure closing valve defective.	Forward converter to AIMD for pressure closing valve replacement and Bench Test.

6-49. CAPACITANCE TEST (FULL). To perform the Capacitance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

NOTE

This test requires simultaneous use of the 50-lb capacity scale and the quantity gage capacitance type tester incorporated in the test stand. Ensure that scale is positioned close enough to tester.

1. Place full converter on a scale of at least 50-lb capacity.

2. Using test stand cable assembly, connect converter cable assembly electrical connectors (17 and 18) to terminals A and B of liquid oxygen quantity gage capacitance type tester.

3. Turn power ON and allow tester to warm up 10 minutes before proceeding.

4. Turn CAPACITANCE RANGE SELECTOR knob to 10X position.

5. Turn FUNCTION SELECTOR knob to CAPACITANCE (UUF) position.

6. Enter total weight of full converter in space provided on Performance Test Sheet.

7. Enter Tare Weight of converter in space provided on Performance Test Sheet.

NOTE

If the weight of the LOX in the converter is 24 lbs 4 oz, 24 lbs 8 oz, and etc.; the ounces must be converted to decimal.

Example

24 lb 4 oz = 24-4/16 lbs
24-4/16 lbs = 24.25 lbs

Enter 24.25 on the Performance Test Sheet.

8. Subtract Tare Weight of converter from total weight. Enter this figure on Performance Test Sheet. This is weight of LOX in converter.

9. Calculate the capacitance maximum (C-max) by multiplying the weight of the LOX (W) by 2.33, and adding 124.7 to the result (2.33(W) + 124.7 = C-max). Enter the result in the space provided on the Performance Test Sheet.

10. Calculate the capacitance minimum (C-min) by multiplying the weight of the LOX (W) by 2.25, and adding 122.3 to the result (2.25(W) + 122.3 = C-min). Enter the result in space provided on Performance Test Sheet.

11. Observe and record capacitance reading from test stand capacitance gage in space provided on Performance Test Sheet. Reading shall be between minimum and maximum established in steps 9 and 10.

NOTE

If capacitance reading is acceptable, proceed to step 14.

If capacitance reading is not within the calculated limits, and the converter has not been purged in previous tests, moisture may be present within the container assembly, proceed to steps 12 and 13.

12. Purge converter in accordance with paragraph 6-43.

13. Fill converter with LOX and repeat Capacitance Test (Full).

NOTE

If capacitance reading is still not within the calculated limits the converter shall be forwarded to the next higher maintenance repair facility.

14. Secure tester and disconnect cable from converter and tester. If converter passes Capacitance Test, proceed to flow test paragraph 6-50.

6-50. FLOW TEST. To perform the Flow Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Hose Assembly, Stand, Test	59A120-B5-12
1	Hose Assembly, Stand, Test	59A120-B51
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Secure converter in rack provided on test stand counter top.

2. Using test stand hose assembly (P/N 59A120-B51/2), interconnect test stand FLOWMETER connection (NIP-4) to CONVERTER SUPPLY OUTLET connection (NIP-5).

3. Using test stand hose assembly (P/N 59A120-B51), connect test stand SUPPLY-TO-CONVERTER connection (NIP-6) to converter supply quick disconnect coupling (46, figure 6-12).

4. Place test stand FLOWMETER SELECTOR valve (V-l) in 0-150-lpm position. Open TEST PRESSURE GAGE BUILD-UP AND FLOW valve (V-10).

NOTE

If TEST PRESSURE gage (PG-1) reads above 90 psig, attach fill vent adapter (P/N 59A120-D5-46) to the fill, buildup, and vent valve. Vent converter system pressure to 70 psig by turning knurled knob clockwise.

5. Open test stand CONVERTER SUPPLY FLOW CONTROL valve (V-9) to a flow of 120 lpm as indicated on FLOWMETER INDICATOR gage (PG-2). Allow flow to the converter for 5 minutes.

6. While maintaining a 120-lpm flow, the converter shall maintain pressure of 55 to 90 psig as indicated on TEST PRESSURE gage (PG-1). Record pressure in space provided on Performance Test Sheet.

7. If converter supply pressure is not within limits, locate probable cause using troubleshooting chart (table 6-7).

8. Disconnect test stand hose assemblies attached in steps 2 and 3. Close all test stand valves.

9. Remove converter from test stand and allow it to remain undisturbed for 1 hour.

6-51. EVAPORATION LOSS TEST (BUILDUP AND SUPPLY MODE). To perform the Evaporation Loss Test in the buildup and supply mode, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

1. Gently place converter on scale and record time and converter weight on Performance Test Sheet.

2. Place converter assembly aside and allow it to remain undisturbed for 24 hours.

3. Carefully place converter on scale and record time and weight in spaces provided on Performance Test Sheet. Weight loss in 24 hours shall not exceed 3.0 lb.

4. If weight loss is 3.0 lb or less, and there is no excessive frosting of the sphere assembly, drain LOX from converter and proceed to converter charge (paragraph 6-53). If weight loss is in excess of 3.0 lb or if there is sphere assembly frosting, consult troubleshooting chart (table 6-8) then proceed to paragraph 6-52.

Table 6-7. Troubleshooting (Flow Test)

Trouble	Probable Cause	Remedy
Converter fails to maintain operating pressure.	Pressure closing valve out of adjustment.	Adjust (paragraph 6-72, step 14).
	Pressure closing valve damaged.	Rebuild or replace.

Table 6-8. Troubleshooting (Evaporation Loss Test, Buildup and Supply Mode)

Trouble	Probable Cause	Remedy
Excessive weight loss.	Loss of vacuum in container assembly.	BCM converter assembly.
Excessive weight loss (Evaporation Loss Test (Buildup and Supply Mode).	Excessively leaking valves, tubing, and/or fittings.	Replace valves. Tighten or replace fittings. Repeat converter leakage test (paragraph 6-46).
	Pressure closing valve out of adjustment or defective.	Adjust pressure closing valve in accordance with paragraph 6-72, step 14.
		Replace pressure closing valve.
Frosting of container assembly.	Loss of vacuum in container.	BCM converter assembly.

6-52. EVAPORATION LOSS TEST (VENTED MODE). To perform the Evaporation Loss Test in the vented mode, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

NOTE

This test required only if converter fails Evaporation Loss Test in buildup and supply mode. By comparing the weight loss of this test to that recorded during the buildup and supply Evaporation Loss Test, it is possible to determine whether sphere assembly degradation, vacuum loss, fitting leakage, or valve malfunction was responsible for converter failure during the buildup and supply Evaporation Loss Test.

1. With converter still on scale, attach test stand fill valve adapter (P/N 59A120-D5-46) to the combination valve on converter.

WARNING

Venting a converter that is in a buildup and supply mode causes a blast of LOX from vent port (40, figure 6-12). Ensure that vent blast is directed away from all personnel, and that adequate clothing and facial protection are worn.

2. Turn knurled knob of adapter clockwise until it seats. This will place the converter in the vented mode.

Table 6-9. Troubleshooting (Evaporation Loss Test, Vented Mode)

Trouble	Probable Cause	Remedy
Excessive weight loss (Evaporation Loss Test (Vented)).	Loss of vacuum in container assembly.	BCM converter assembly.
Weight loss in vented mode is less than in the buildup and supply mode.	Excessively leaking valves, tubing, and/or fittings when unit failed buildup and supply mode evaporation loss test.	Replace valves. Tighten or replace fittings. Repeat Converter Leakage Test (paragraph 6-46).
	Pressure closing valve out of adjustment or defective when unit failed buildup and supply mode evaporation loss test.	Adjust pressure closing valve in accordance with paragraph 6-72, step 14.
		Replace pressure closing valve.
Excessive frosting of container assembly.	Loss of vacuum in container.	BCM converter assembly.

3. After converter stabilizes, record time and weight in space provided on Performance Test Sheet.

4. Place converter aside and allow it to remain undisturbed in the vented mode for 24 hours.

5. At the end of the 24-hour period, carefully place converter on scale.

6. Record time and weight in spaces provided on Performance Test Sheet. Weight loss in 24 hours shall not exceed 5.0 lbs.

NOTE

A converter that loses 5.0 lbs or less in the vented mode and the weight loss is more than in the buildup and supply mode (see example A) shall be considered an acceptable unit. If the weight loss is more than 5.0 lbs (see example B) or if the weight loss is less than it was in the buildup and supply mode (see example C) locate probable cause using troubleshooting chart (table 6-9).

Example A:
Weight loss
buildup and supply mode = 3.5 lbs.
Weight loss vented mode = 4.0 lbs.
Converter is RFI.

Example B:
Weight loss
buildup and supply mode = 4.0 lbs.
Weight loss vented mode = 6.0 lbs.
Locate probable cause
using troubleshooting chart.

Example C:
Weight loss
buildup and supply mode = 4.0 lbs.
Weight loss vented mode = 3.0 lbs.
Locate probable cause
using troubleshooting chart.

7. Remove fill valve adapter (P/N 59A120-D5-46) installed in step 1.

WARNING

Ensure that all personnel safety precautions are observed during converter drain.

8. Place converter in LOX drain pan and drain converter completely of all LOX.

6-53. CONVERTER CHARGE. To charge the converter, proceed as follows:

NOTE

Liquid oxygen converters that fail bench test and are beyond capability of maintenance (BCM) do not require converter charge.

CAUTION

Upon completion of Bench Test, converter shall be charged with gaseous oxygen to 25 to 30 psig to prevent entry of moisture and other contaminants during shipment/storage.

1. Secure converter in rack provided on test stand counter top.

2. Attach quick-disconnect coupling (P/N 199000-1) to test stand hose assembly (P/N 59A120-B5-14).

3. Using hose assembly, connect test stand BELL JAR BOTTOM COUPLING (C-1) to converter coupling assembly (46).

4. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

CAUTION

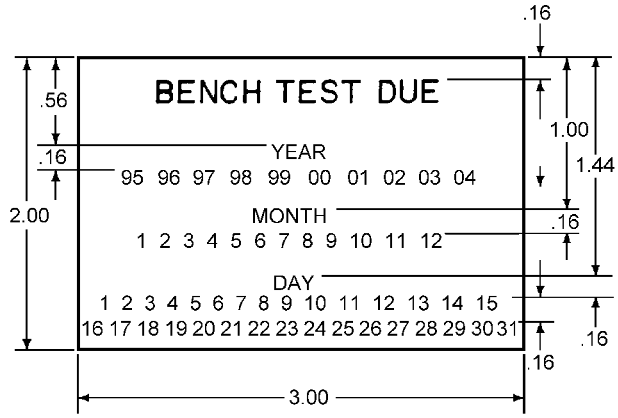
Open OXYGEN SUPPLY valve (V-6) slowly when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

5. Using OXYGEN SUPPLY valve (V-6), charge converter to 25 to 30 psig. Pressure will be indicated on TEST PRESSURE gage (PG-1).

6. Close OXYGEN SUPPLY valve (V-6), disconnect hose assembly connected in step 2, and bleed test stand using SYSTEM BLEED valve (V-5). Secure all test stand valves.

7. Test stand operator and CDI sign Performance Test Sheet. Retain Performance Test Sheet until next scheduled bench test is performed.

8. Mark due-date of next Bench Test on bench test decal (figure 6-10). Due date shall be 231 days from last Bench Test date. Affix decal to converter in a position in which it will be visible when converter is installed in aircraft.



NOTES:

1 MATERIAL SHALL BE ELASTOMERIC PRESSURE SENSITIVE TYPE ADHESIVE BACKED, IN ACCORDANCE WITH MIL-M-43719, TYPE I, CLASS 1.
2 ALL LETTERS AND NUMBERS SHALL APPROXIMATELY MATCH GREEN NO. 14187 OF FED. STD. NO. 595; BACKGROUND SHALL APPROXIMATELY MATCH WHITE NO. 17875 OF FED. STD. NO. 595.
3 BENCH TEST DUE SHALL BE 18-POINT GOTHIC (SANS SERIF) LETTERING. ALL OTHER NUMBERS AND LETTERS SHALL BE 10-POINT, GOTHIC (SANS SERIF).

006010

Figure 6-10. Bench Test Decal

9. Annotate station/ship performing Bench Test on a serviceable condition label and affix to bench test decal so as not to interfere with marked due date.

NOTE

Bench test decals may be procured from Customer Service at the nearest NARF.

10. Install dust covers or plugs in/on all open couplings prior to shipping or storage converter.

6-54. DISASSEMBLY.

6-55. LIQUID OXYGEN CONVERTER ASSEMBLY. To disassemble the Liquid Oxygen Converter use index numbers assigned to figure 6-12, unless otherwise noted. Disassemble the converter only as far as necessary to correct any malfunctions. Disassemble the converter as follows:

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy build-up (in excess if 130 psig) or critical over-pressurization, immediately comply with the emergency pressure relief procedures given paragraph 6-28 at the beginning of this section.

CAUTION

All disassembly, inspection, repair and assembly must be done on benches having good lighting and in an area provided with air conditioning. Walls, floor and ceiling should have a smooth finish, and be painted with a non-chalking paint which can be kept clean and dust free. It is desirable to keep all parts for each individual LOX converter separated. Make careful note of the location, angle of fitting, and quantity of all parts. Plastic partitioned boxes should be used to keep the parts segregated and protected from dirt and moisture. Plastic bags are also useful for storing subassemblies and component parts after cleaning and inspection until ready for assembly.

NOTE

Discard all O-rings, gaskets, seals, and teflon sealing tape removed from oxygen connections during disassembly.

No special tools are required to disassemble, adjust or assemble this converter.

1. Remove handle (29) by removing two screws (30), two washers (31), two bushings (32), and two nuts (33).

2. Remove grommet (5) from vent tube assembly (6) by removing lock wire (4).

3. Remove vent tube assembly (6) by loosening tube nuts at each end.

4. Remove pressure closing valve from build-up port tube (7) by loosening tube nut at each end.

5. Remove coupling assembly (40) from Combination Valve (41).

6. Disconnect manifold assembly (36) by loosening tube nuts from Combination Valve (41), pressure closing valve (44), tee fitting (2), and elbow (47).

7. Remove Combination Valve (41) from mounting pad assembly (50) by removing four screws (42). Remove preformed packing (43) from fill port of combination valve (41).

8. Remove pressure closing valve (44) by removing two screws (45).

9. Remove cap assembly (1), tee fitting (2) and elbow (3) from Container Assembly (8).

10. Remove Container Assembly (8) by removing four screws, (9), four nuts (12) and four shock mount assemblies.

NOTE

A shock mount assembly consists of two washers (10), shock mount (11), two cup-shock pads (27) and shock mount (28).

11. Remove manifold assembly (36) by removing four screws (37) and four nuts (39), which releases securing clamps (38).

12. Remove 45° elbow (47) and coupling assembly (46) from mounting pad assembly (49).

6-56. CONTAINER ASSEMBLY. To disassemble the container, proceed as follows:

NOTE

Disassemble the Container Assembly using index numbers assigned to figure 6-12.

1. Disconnect cap and chain assemblies (13) and (14) by removing screw (15) and nut (16).

2. Remove two nuts and two washers holding electrical connectors (17) and (18) in place on bracket (21).

3. Remove connection bracket (21) by removing three screws (22), three washers (23), three nuts (24) and three fuse clips (25).

4. Remove flared tube nipple (26) from Container Assembly.

6-57. COMBINATION VALVE ASSEMBLY. To disassemble the Combination Valve Assembly, proceed as follows:

NOTE

Disassemble the Combination Valve using index number assigned to figure 6-13.

1. Remove 90° elbow (1) and 45° elbows (2) from Combination Valve assembly.

WARNING

Build-up seat (3) is spring loaded, use caution when removing.

2. Remove build-up seat (3), clamping spacer (5), washer (6) and preformed packing (7) from Combination Valve housing (44) by removing four screws (4). Helical compression spring (8) and ball valve (10) with attached ring (9) can now be removed from build-up port.

3. Using retaining ring pliers, remove ring (9) from ball valve (10).

4. Remove cap assembly (11) from Combination Valve housing (44) by removing screw (12) and washer (13).

5. Remove bristo setscrew (14). Using a strap wrench, remove filler head (15) and washer (17) from combination valve housing.

6. Extract shaft (25) with preformed packing (18), ring (19), washer (20), spring (21), washer (22), sleeve (23) and ring (24), attached, from housing (44).

7. Remove preformed packing (18) from shaft (25).

8. Using retaining ring pliers, remove ring (19) and slide off washer (20), spring (21), washer (22) and sleeve (23), then using retaining ring pliers again remove ring (24).

9. Extract expansion plug (26) from housing (44).

10. Using retaining ring pliers, remove ring (27) and extract washer (28), spring (29), checkvalve head (30), sleeve (31), seat (32) and preformed packing (35).

11. Using a spanner wrench, remove retainer (34) from housing (47) and extract spring (35), bellows (38), gasket (39), valve (40), spring (41), screen (42) and cup (43).

NOTE

If disassembly of retainer (34) is required, note the relative position of stopscrew (36) and adjusting screw (37). This will allow for a good starting point for assembly and adjustment.

12. Disassembly retainer (34) by removing stopscrew (36) and adjusting screw (37).

6-58. PRESSURE CLOSING VALVE ASSEMBLY. To disassembly the Pressure Closing Valve Assembly, proceed as follows:

NOTE

Disassemble the Pressure Closing Valve using index numbers assigned to figure 6-13.

1. Remove elbows (1) and (2) from housing (15).

2. Using retaining ring pliers, remove ring (3) and extract filter (4), spring (5), stem (6), and disc (8).

3. Cut off lockwire (8) and remove cover (9) and disc (10).

4. Using a spanner wrench, remove bellows assembly (13) and O-ring (14).

NOTE

If disassembly of bellows assembly (13) is required, note relative position of adjusting screw (11). This will provide initial adjustment used later in assembly.

5. Disassemble bellows assembly (13) by removing O-ring (14), adjusting screw (11), and spring (12).

6-59. CLEANING.

6-60. To clean the disassembled converter, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Bag, Plastic	MIL-B-117
As Required	Nitrogen, Oil-free, Water Pumped, Type I, Class I, Grade B	Fed Spec BB-N-411 NIIN 00-985-7275
1	Wash Bottle	MS36070A

WARNING

Do not use oil, or any material containing oil, in conjunction with oxygen equipment. Oil, even in a minute quantity, coming in contact with oxygen can cause explosion or fire. Dust, lint, or fine metal particles are also dangerous.

1. Clean all metallic parts using procedures outlined in NAVAIR 13-1-6.4-1. Blow dry with oil-free nitrogen.

2. Prior to installation, wash all silicone rubber parts in distilled water and blow dry with oil-free nitrogen.

3. After cleaning, surfaces shall be examined for cleanliness. Should further contamination be found, reclean the parts in accordance with step 1.

4. Cleaned parts shall be sealed in plastic bags for storage. Bag all complete assemblies that are not immediately returned to service.

6-61. INSPECTION OF DISASSEMBLED PARTS.

6-62. Inspect the disassembled converter and component parts in accordance with table 6-10 and the following special instructions:

1. Inspect all hardware items (nipples, elbows, etc.) for stripped threads, burrs, nicks, distortion, rust, corrosion, or other defects.

NOTE

Because of the method of suspension of shockmounting of the inner container, some looseness can be detected in most containers by shaking the converter vigorously. Some models employ a spring type suspension that eventually loses some tension. Others have a nylon type spacer that experiences slight shrinkage. Looseness and rattles become more apparent with age. Some looseness can be detected in many new containers. Looseness or rattles is not a criterion for determining serviceability. The integrity of the container is determined by the 24-hour evaporation Loss Test.

6-63. REPAIR.

6-64. Repair of the converter assembly is limited to replacing defective components, minor repairs (small dents, scratches, abrasions, nicks, etc) of tubing and sphere assembly, reattachment of pinch-off tube protective cover, and touching-up painted surfaces. To make minor repairs, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Adhesive	NIIN 00-738-6429
As Required	Lacquer-Cellulose Nitrate, Glass Color 622, Jet Black	MIL-L-7178
As Required	Paint, Green, (Color 14187)	(Note 1)

Notes: 1. Use any available green paint, chip color 14187, approved by local Environmental Protection Agency.

1. Tubing assemblies with minor dents not causing flow restriction are considered serviceable. Small scratches, abrasions, and nicks can be smoothed with a burnishing tool or aluminum wool.

2. To avoid burnishing the same area more than once, each burnished area shall be identified by a painted band. Color and size of bands are as follows:

Table 6-10. Inspection of Disassembled Parts

Part Nomenclature	Index Number	Inspect For	Remedy
Identification and performance plates.	6-12-35 6-12-48	Security, condition and legibility.	Secure in place or replace if damaged or illegible.
Warning and bench test decals.	6-12-34 6-12-49	Presence and condition.	Apply or replace as required.
Handle.	6-12-29	Bends and cracks.	Replace.
Tubing assemblies.	6-12-6 6-12-7 6-12-36	Cracks, dents, nicks, scratches, twists or damaged connectors and tube nuts.	Replace.
Elbows and nipples.	All	Cracks, dents, scratches and damaged threads.	Replace.
Male coupling assemblies.	6-12-40 6-12-46	Visible damage.	Replace.
Shock mount assemblies.	6-12-11 6-12-27 6-12-28	Visible damage.	Replace.
Clamps.	6-12-38	Condition.	Tighten or replace.
Mounting pad assembly.	6-12-50	Cracks, broken welds, or other visible damage.	Replace.
Container assembly.	6-12-8	Dents, chipped paint or other visible damage.	Refer to paragraph 6-63 for size of acceptable dents. Restore finish by painting (paragraph 6-63).
Dust caps.	6-12-14	Broken chain or damage cap.	Replace.
Fuse clips.	6-12-25	Damage.	Replace.
Build-up seat.	6-13-3	Scratches, nicks or wear on sealing surfaces.	Replace.
Filler head.	6-13-15	Cracks, wear or any visible damage of sealing surfaces.	Replace.
Shaft.	6-13-25	Bend, nicks, scratches or wear.	Replace.
Combination valve housing.	6-13-44	Scratches, nicks, or any visible damage to sealing surfaces.	Replace.
Pressure closing valve housing.	6-14-15	Scratches, nicks, wear or any visible damage on sealing surfaces.	Replace.
Stem.	6-14-6	Scratches, nicks, wear or any visible damage on sealing surfaces.	Replace.
Filter.	6-13-4	Clogged pores or visible damage.	Clean and/or replace.

a. Color bands shall cover an area not less than 2 inches, nor more than 3 inches in length.

b. Green paint shall be used on black and aluminum tubing.

c. Black lacquer shall be used on green tubing.

d. If tubing is repainted, reidentify burnished area.

3. Tubing nicked, abraded, or scratched in an area previously identified as burnished shall be condemned.

4. Container assemblies having minor dents are considered serviceable, provided the container passes the vented evaporation loss test. Normally, dents up to 3/8-inch deep will not affect function of the sphere.

WARNING

When painting converter, ensure that fittings, tubing, and valves are removed or masked prior to painting. Paint and other foreign matter associated with painting introduced into these components could create an explosion hazard when contacting oxygen.

5. Container assemblies passing the vented Evaporation Loss Test and having dents shall be identified by painting a 3/4-inch diameter dot over each dent using black lacquer.

NOTE

Prior to replacing pinch-off tube protective cover, an evaporation loss test (vented condition) shall be performed in accordance with paragraph 6-52. This will ensure that the pinch-off tube was not damaged by whatever force loosened the protective cover.

6. Pinch-off tube protective covers maybe secured back in place over the pinch-off tube as follows:

a. Clean area surrounding pinch-off tube and flange area of protective cover by sanding followed by cleaning area using procedures outlined in NAVAIR 13-1-6.4-1.

b. Mix equal portion of part “A” resin and part “B” activator. Mix thoroughly following instructions provided with adhesive.

c. Apply adhesive to flange of protective cover. Place cover over pinch-off tube, pressing in place to achieve a good bond. Wipe off excess adhesive and allow cover to remain undisturbed for approximately 8 hours.

6-65. ASSEMBLY.

6-66. Assembly of the Liquid Oxygen Converter Assembly is essentially the reverse of disassembly. Test and adjustments are required on certain subassemblies as they are assembled to the converter.

WARNING

Prior to use, inspect leak detection compound. Compound which is not clear and free from suspended material/sediment is considered contaminated and shall be disposed of. Compound exhibiting peculiar odors such as acetone or alcohol is considered contaminated and shall be disposed of.

CAUTION

Use anti-seize tape (MIL-T-27730) on all male pipe thread fittings. Apply single layer of tape, overlapping ends just enough to avoid gap in tape when fitting is installed. To prevent tube blockage, ensure that tape is clear of last thread.

Do not use anti-seize tape on flared or straight thread fittings.

NOTE

Using converter overhaul parts kit (P/N 1601217-1), install new O-rings, gaskets, seals, and replacement parts wherever possible, depending on how extensive disassembly was.

6-67. ASSEMBLY OF PRESSURE CLOSING VALVE. To assemble the Pressure Closing Valve proceed as follows:

NOTE

Assemble the Pressure Closing Valve using index number assigned to figure 6-14.

1. Assemble bellows assembly (13) by installing O-ring (14), spring (12), and adjusting screw (11). Adjusting screw shall be installed to noted position before disassembly.

2. Using a spanner wrench, install assembled bellows into pressure closing valve housing (15).

NOTE

Lockwire (8), cover (9), and disc (10) are not installed at this time. These parts will be installed after entire converter assembly is assembled and adjusted for correct operation.

3. Install disc (7) onto stem (6). Insert stem (6), spring (5), and filter (4) (coarse side up) into housing (15).

4. Using retaining ring pliers, install ring (3), securing parts inserted in step 3. Ensure that retaining ring is properly seated in groove provided.

5. Install elbows (1) and (2) into housing (15). Position where noted before disassembly.

6-68. Delivery Pressure Verification/Leakage Test of Pressure Closing Valve. To Verify Delivery Pressure and to Leak-Test the Pressure Closing Valve following assembly, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Index numbers in parentheses refer to figure 6-14.

1. Attach gage to elbow (1).

2. Attach buildup coil port elbow (2) to BELL JAR BOTTOM COUPLING (C-1).

3. Open TEST PRESSURE GAGE TO BELL JAR valve (V-2).

4. Open OXYGEN SUPPLY valve (V-6), and apply 120 psig as indicated on TEST PRESSURE gage (PG-1). Pressure gage attached to elbow (1) should read between 55 and 90 psig.

NOTE

If outlet pressure does not fall within the 55 to 90 psig limit, adjust the pressure closing valve in accordance with paragraph 6-72, step 14.

5. Ensure that 120 psig is indicated on TEST PRESSURE gage (PG-1). Hold pressure for 5 minutes. Any increase of pressure shown on gage attached to elbow (1) indicates internal leakage and cause for rejection.

6. Apply leak detection compound to elbows (1 and 2) and bellows assembly (13). No leakage is allowed. Correct any leakage prior to proceeding.

7. Close OXYGEN SUPPLY valve (V-6), and bleed test pressure using SYSTEM BLEED valve (V-5).

8. Remove pressure closing valve from test stand and remove gage installed in step 1.

9. Remove any excess leak detection compound from valve assembly and set aside.

NOTE

Installation and adjustment of pressure closing valve will be performed in paragraph 6-72, step 14.

6-69. ASSEMBLY OF COMBINATION VALVE. To assemble the Combination Valve, proceed as follows:

NOTE

Assemble the Combination Valve using figure 6-11 and index numbers assigned to figure 6-13.

1. If required, assemble retainer (34) by installing stopscrew (36) and adjusting screw (37) to positions noted prior to disassembly.

2. Insert filter screen (42) into spring cup (43) and carefully place cup into relief valve port with filter screen facing up.

3. Place spring (41) on valve (40) and insert unit into relief valve port with spring (41) resting in spring cup (43).

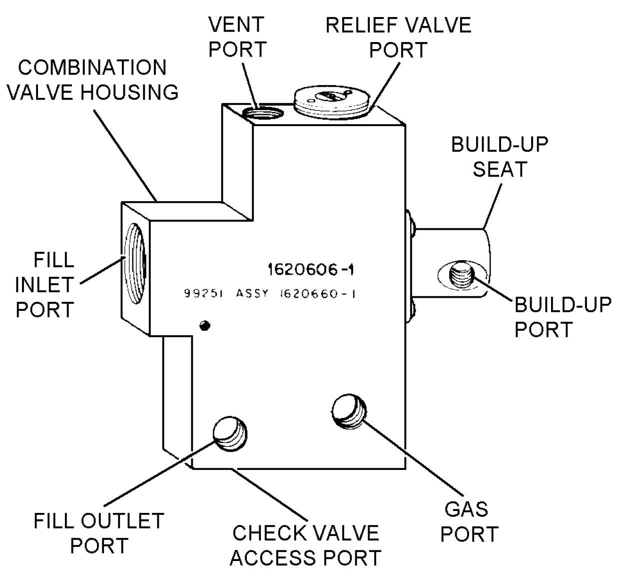


Figure 6-11. Location of Ports on Combination Valve Assembly

4. Place gasket (39) onto bellows (38) and insert into relief valve port.

5. Insert spring (35) into bellows (38) and install assembled retainer (34). Tighten retainer in place using a spanner wrench.

6. Place O-ring (33) onto check valve seat (32) and insert unit into check valve access port of housing (44), O-ring side first.

7. Insert sleeve (31), check valve head (30) (dimple side first), spring (29), and washer (28) (collar side first) into check valve access port.

8. Using retaining ring pliers, secure inserted parts in place with ring (27). Ensure that retaining ring is properly seated in groove provided.

9. Install expansion plug (26) into check valve access port.

10. Using retaining ring pliers, install ring (9) in groove provided on ball (10) and insert unit into buildup port of housing (44).

11. Place spring (8) on ball (10).

12. Place washer (6) and preformed packing (7) onto buildup seat (3) and insert into buildup port of housing (44).

13. Secure buildup seat (3) to housing using spacer (5) and four screws (4). Position buildup seat where noted prior to disassembly.

14. Using retaining ring pliers, install ring (24) into appropriate groove on shaft (25).

15. Place plunger sleeve (23), washer (22), spring (21) and washer (20) onto shaft (25). Using retaining ring pliers secure items with ring (19). Ensure ring is seated in groove provided.

16. Install preformed packing (18) into groove provided on shaft (25).

17. Insert assembled shaft into fill inlet port of housing (44).

18. Install filler head insert (16) into filler head (15), if required.

19. Place gasket (17) on filler head (15) and install filler head into fill inlet port. Tighten filler head with strapwrench and secure with bristo setscrew (14).

20. Attach cap assembly (11) with screw (12) and washer (13).

21. Install elbow (1) and elbows (2) to position noted before disassembly.

6-70. Leakage Test Port Assembly Of Combination Valve. To perform the various leakage tests on the Assembled Combination Valve proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
2	Capnut	AN929-5
1	Hose Assembly, Stand, Test	59A120-B5-12
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1
1	Plug, Pipe	MS20913-C-3

1. Using capnut (AN929-5), cap the gas port elbow (1).

2. Attach adapter to filler head of combination valve and turn knurled knob clockwise.

3. Attach vent port of combination valve to BELL JAR BOTTOM COUPLING (C-1). Open TEST PRESSURE GAGE TO BELL JAR valve (V-2).

4. Open OXYGEN SUPPLY valve (V-6) and apply 35 psig as indicated on TEST PRESSURE gage (PG-1).

5. Apply leak detection compound to fill port, no leakage allowed.

6. Close OXYGEN SUPPLY valve (V-6) and bleed test stand using SYSTEM BLEED valve (V-5).

7. Remove adapter from filler head of combination valve and disconnect test stand BELL JAR BOTTOM COUPLING (C-1) from vent port of combination valve.

8. Connect test stand BELL JAR BOTTOM COUPLING (C-1) to buildup port elbow (3).

9. Using a pipe plug, plug vent port of combination valve.

10. Open OXYGEN SUPPLY valve (V-6) and apply 100 psig as indicated on TEST PRESSURE gage (PG-1).

11. Apply Leak Detection Compound to combination valve. No leakage is allowed.

12. Close OXYGEN SUPPLY valve (V-6) and bleed pressure from test stand using SYSTEM BLEED valve (V-5).

13. Place combination valve in the vented position by attaching adapter to filler head of combination valve and uncap gas port (1).

14. Place test stand bell jar over combination valve and secure in place.

15. Place FLOWMETER SELECTOR valve (V-1) in the 0-0.25 lpm position.

16. Using OXYGEN SUPPLY valve (V-6), apply 35 psig to the combination valve as indicated on TEST PRESSURE gage (PG-1).

17. Using test stand hose assembly, slowly interconnect BELL JAR TOP COUPLING (C-2) to FLOWMETER connection (NIP-1) while observing FLOWMETER INDICATOR gage (PG-2).

18. Maintain 35 psig to the combination valve for 2 minutes, leakage on FLOWMETER INDICATOR gage (PG-2) shall not exceed 0.25 lpm.

19. Close OXYGEN SUPPLY valve (V-6) and bleed pressure from test stand using SYSTEM BLEED valve (V-5).

20. Disconnect combination valve from test stand, unplug vent port and remove adapter.

21. Test and adjust relief valve as follows:

a. Cap gas port nipple (2) with capnut.

b. Connect build-up port, elbow (2) to test stand BELL JAR BOTTOM COUPLING (C-1). Install and secure bell jar.

c. Using hose assembly, interconnect BELL JAR TOP COUPLING (C-2) to FLOWMETER connection (NIP-4).

d. Turn FLOWMETER SELECTOR valve (V-1) to 0-150 lpm position.

CAUTION

Do not apply pressure above 130 psig. When applying pressure with OXYGEN SUPPLY valve (V-6) observe TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2). Rapid surges of pressure could damage test stand gages.

e. Open OXYGEN SUPPLY valve (V-6) slowly and apply pressure to the relief valve. Pressure will be indicated on TEST PRESSURE gage (PG-1).

f. When pressure reaches 100 to 120 psig, relief valve shall be venting a minimum 100 lpm as indicated on FLOWMETER INDICATOR gage (PG-2).

g. Disconnect test stand hose assembly from FLOWMETER connection (NIP-4) and connect it to FLOWMETER connection (NIP-1).

h. Turn FLOWMETER SELECTOR valve (V-1) to 0.0-0.25 lpm position.

i. Using test stand hose assembly, slowly interconnect BELL JAR TOP COUPLING (C-2) to FLOWMETER connection (NIP-1) while observing FLOWMETER INDICATOR gage (PG-2).

j. With 95 psig and below applied to the relief valve as indicated on TEST PRESSURE gage (PG-1), maximum allowable leakage, indicated on FLOWMETER INDICATOR gage (PG-2), shall be 0.01 lpm.

NOTE

If readings in steps f and j are acceptable, proceed to step m.

If readings are not acceptable, adjust relief valve in accordance with steps k thru m.

k. Remove bell jar off of combination valve.

l. If valve relieves below 100 psig, turn adjusting screw (37) clockwise. If valve relieves above 120 psig, turn adjusting screw (37) counterclockwise. Turn stopscrew (36) to obtain the required flow.

NOTE

Turning stopscrew clockwise will increase flow, counterclockwise will decrease flow.

m. Place bell jar over combination valve and secure in place. Repeat steps c thru j.

NOTE

It may be necessary to repeat steps k thru m several times to obtain proper pressure and flow settings.

n. At completion of test and adjustment, remove bell jar, disconnect combination valve, uncap all ports and set valve aside, ready for installation.

6-71. ASSEMBLY OF CONTAINER. To assemble the Container Assembly proceed as follows:

NOTE

Assemble the Container Assembly using index numbers assigned to figure 6-12.

1. Install flared tube nipple (26) to container assembly (8).

2. Secure connection bracket (21) and fuse clips (25) with screws (22), washers (23) and nuts (24).

3. Assemble and attach electrical connectors (17) and (18) to bracket (21) with respective nuts and washers.

4. Attach cap and chain assemblies (13) and (14) with screw (15) and nut (16).

6-72. COMPLETION OF ASSEMBLY. To complete the assembly of the converter, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Lockwire	MS20995C20

CAUTION

When installing tube assemblies, ensure fittings to which tube nuts are to be attached are properly aligned with tube to prevent cross threading. Hold connecting fittings with open end wrench to avoid straining or breakage when tightening. Hold tubing away from other components of converter assembly while tightening so that a minimum 1/16-inch clearance is maintained. It may be necessary to slightly bend some tube assemblies to maintain this clearance. Ensure tubing is not crimped after bending process.

NOTE

To complete the assembly of the converter use index numbers assigned to figure 6-12.

1. Install 45° elbow (47) and coupling assembly (46) to mounting pad assembly (50).

2. Secure manifold assembly (36) to mounting pad (50) using four screws (37), four clamps (38) and four nuts (39).

NOTE

A shock mount assembly consists of two washers (10), shock mount (11), two cup shock pads (27) and shock mount (28).

3. Secure Container Assembly (8) to mounting pad assembly (50) using four screws (9), four shock mount assemblies and four nuts (12) as follows:

a. Tighten screw (9) and nut (12) so that the distance between the top of the mounting pad to the bottom of each foot of the Container Assembly is 7/8 ± 1/32 inch.

4. Assemble elbow (3), tee (2) and cap assembly (1) to Container Assembly (8).

5. Mount pressure closing valve (44) to mounting pad assembly (50) with two screws (45).

6. Place preformed packing (43) into the check valve access port and carefully mount combination valve (41) to mounting pad (50) with four screws (42). Ensure preformed packing (43) is positioned correctly before securing.

7. Connect tube nuts of manifold assembly (36) to combination valve (41), pressure closing valve (44), tee (2) and elbow (47).

8. Attach coupling assembly (40) to combination valve (41).

9. Attach pressure closing valve to build-up port tube (7) to elbow (1) (figure 6-14) atop pressure closing valve (44) and build-up port elbow (2) (figure 6-13) of combination valve (41).

10. Attach vent tube assembly (6) to flared tube nipple (26) and gas port elbow (1) (figure 6-13) of combination valve.

11. Secure grommet (5) to vent tube assembly (6) using lockwire (MS20995C20).

12. Attach handle (29) with two screws (30), two washers (31), two bushings (32) and two nuts (33).

13. After completion of assembly, Bench Test the converter in accordance with paragraph 6-40.

14. During post assembly Bench Test, it may be necessary to adjust pressure closing valve (44) while performing the flow test paragraph 6-50. If so, proceed as follows:

NOTE

Index numbers in parentheses refer to figure 6-14.

a. If required remove disc (10) by cutting lockwire (8) and cover (9).

NOTE

The 70 to 75 psig operating pressure is for adjustment purposes only. If converter maintains 55 to 90 psig, no adjustment is required. If converter pressure is above or below this range, adjust pressure closing valve to maintain 70 to 75 psig.

b. Using a screwdriver, turn adjusting screw (1) until a supply pressure of 70 to 75 psig is maintained with a flow of 120 lpm.

NOTE

Turn adjusting screw (11) clockwise to increase valve closing pressure and counterclockwise to decrease valve closing pressure. Flow converter at least 30 minutes to ensure pressure is constant.

c. After correct setting of pressure closing valve is ensured, install cupped disc (10) (convex side up) and cover (9). Secure cover (9) in place using lockwire.

Section 6-5. Illustrated Parts Breakdown

6-73. GENERAL.

6-74. This Section lists and illustrates the assemblies and detail parts of the Liquid Oxygen Converter Assembly, Type GCU-24/A, P/N 29073-D2 manufactured by Litton Life Support, formerly Bendix Corporation (CAGE 99257).

6-75. The Illustrated Parts Breakdown should be used during maintenance when requisitioning and identifying parts.

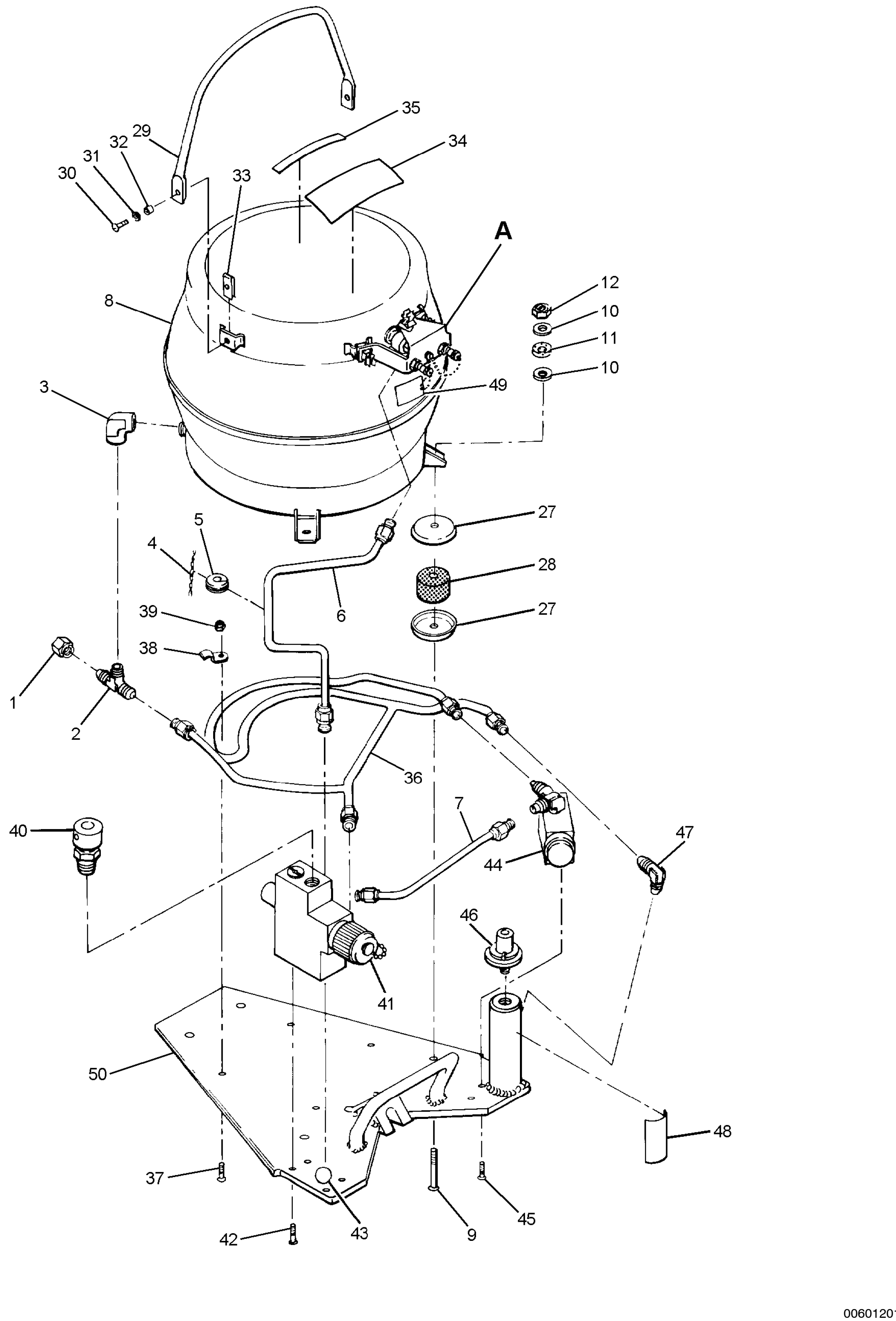


Figure 6-12. Liquid Oxygen Converter, Type GCU-24/A, P/N 29073-D2 (Sheet 1 of 2)

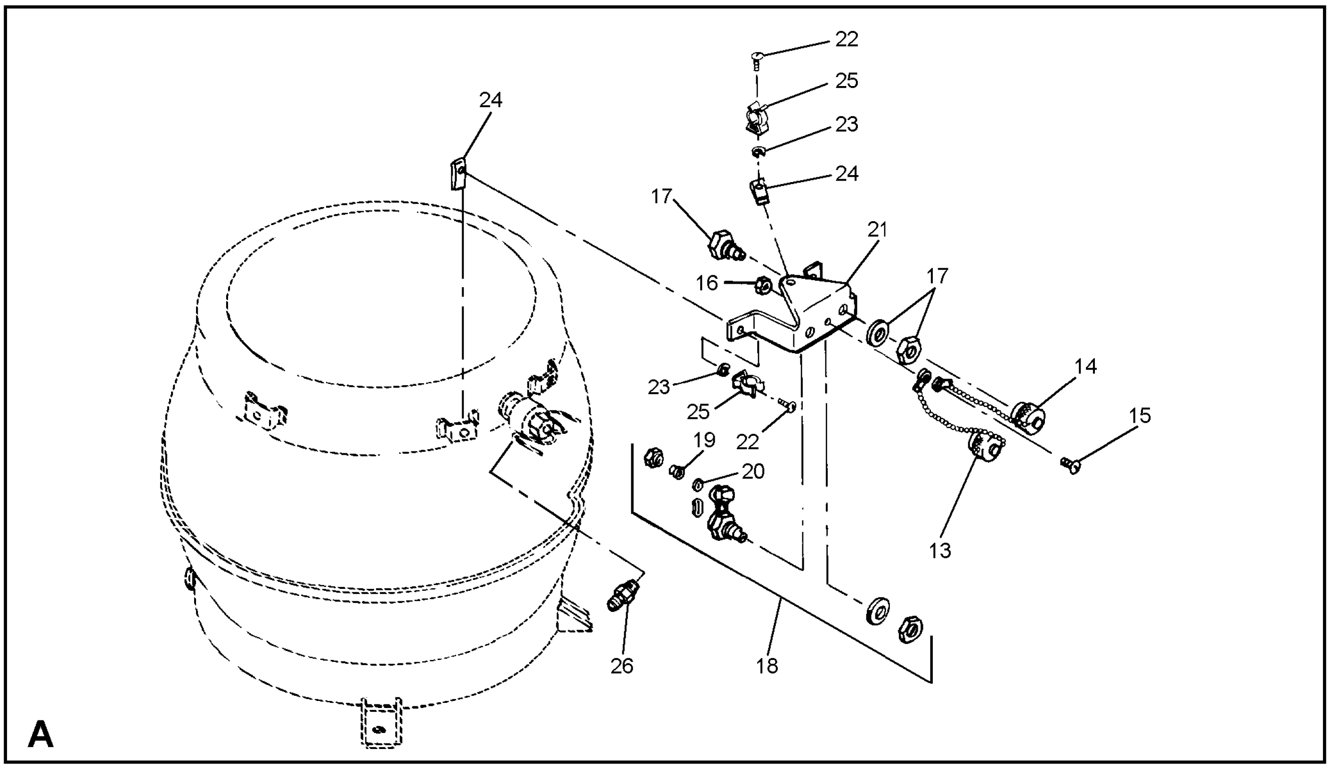


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Figure 6-12. Liquid Oxygen Converter, Type GCU-24/A, P/N 29073-D2 (Sheet 2 of 2)

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
6-12	29073-D2	CONVERTER ASSEMBLY, Liquid Oxygen . . . . 10 liter (Note 1)	1	
-1	AN929-5	. CAP	1	
-2	MS20825-5D	. TEE FITTING	1	
-3	AN916-1D	. ELBOW	1	
-4	MS20995C32	. LOCKWIRE	A/R	
-5	MS35489-10S	. GROMMET	1	
-6	1616742-1	. TUBE ASSEMBLY, Vent	1	
-7	1620661-1	. TUBE ASSEMBLY, Pressure Closing to . . . . Build Up	1	
-8	1623334-1	. CONTAINER ASSEMBLY, Liquid Oxygen . . . . . (ATTACHING PARTS)	1	
-9	MS24694C115	. SCREW, Machine, flat head	4	
-10	1603660-38	. WASHER, Flat (KD)	8	
-11	1622347-2	. SHOCK, MOUNT	4	
-12	MS21045C4	. NUT, Self-locking . . . . ---*---	4	
-13	1-606-1	. . CAP AND CHAIN /CAGE 95712/	1	
-14	1-606-2	. . CAP AND CHAIN /CAGE 95712/ . . . . (ATTACHING PARTS)	1	
-15	RO-405SS	. . SCREW /CAGE 80058/	1	
-16	NTNO-4SCP	. . NUT /CAGE 06840/ . . . . ---*---	1	
-17	JP22E	CONNECTOR, Electrical Miniature, ... Coaxial “E” Polarity / CAGE 05209/	1	
-18	6690-1	. . CONNECTOR, Electrical Miniature, ... Coaxial “B” Polarity /CAGE 95712/	1	
-19	1611420-1	. . ADAPTER, Armored Wire (KF)	1	
-20	1611421-1	. . SPACER, Dage Connector (KF)	1	
-21	1623329- 1	. . BRACKET, Connector . . . . (ATTACHING PARTS)	1	
-22	AN515C8-6	. . SCREW, Machine, roundhead	3	
-23	WO-8SS	. . WASHER	3	
-24	C14938SS832	. . NUT, “U” Type /CAGE (KF) 78553/ . . . . (Note 2) ---*---	3	
-25	104002	. . FUSE CLIP /CAGE 75915/ (Note 3)	3	
-26	AN816-5D	. . NIPPLE, Flared Tube	1	
-27	1611428-2	. CUP, Shock Pad	8	
-28	1622347-1	. SHOCK MOUNT	4	
-29	1611453-1	. HANDLE . . . . (ATTACHING PARTS)	1	
-30	AN525-832-6	. SCREW, Washer Head	2	
-31	WO-8SS	. WASHER	2	
-32	1611434-1	. BUSHING (KF)	2	

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
6-12-33	C14938SS832	. NUT, "U" Type /CAGE (KF) 78553/ . . . . (Note 2) ---*---	2	
-34	1600482-1	. LABEL, Warning	1	
-35	1616834-1	. LABEL, Test Data	1	
-36	1626449-1	. MANIFOLD ASSEMBLY . . . . (ATTACHING PARTS)	1	
-37	MS24693C6	. SCREW, Machine, flathead	4	
-38	1611433-1	. CLAMP, Tube (KF)	4	
-39	MS20365-440	. NUT, Self-locking . . . . ---*---	4	
-40	MS22068-6	. COUPLING ASSEMBLY	1	
-41	1620660-1	. VALVE ASSEMBLY, Combination . . . . (figure 6-13 for BKDN) (ATTACHING PARTS)	1	
-42	MS24693C49	. SCREW, Machine, flathead . . . . ---*---	4	
-43	1602321-17	. PACKING, Preformed	1	
-44	1616733-1	. VALVE ASSEMBLY, Pressure Closing . . . . (figure 6-14 for BKDN) (ATTACHING PARTS)	1	
-45	MS24693C27	. SCREW, Machine, flathead . . . . ---*---	2	
-46	MS22068-4	. COUPLING ASSEMBLY	1	
-47	MS20823-5D	. ELBOW	1	
-48	1616833-1	. PLATE, Identification	1	
-49	CL227C2-1	. DECAL, Bench Test, date	1	
-50	1616648-1	. PAD ASSEMBLY, Mounting	1	
	1601217-1	PARTS KIT, Converter Overhaul (KF) . . . . (Note 1)	1	

Notes:
1. Liquid oxygen converter overhaul parts kit (P/N 1601217-1) is supplied by The Bendix Corporation (CAGE 99251).
2. Bendix P/N 1621020-1, which is listed and contained within the parts kit.
3. Bendix P/N 1609254-1.

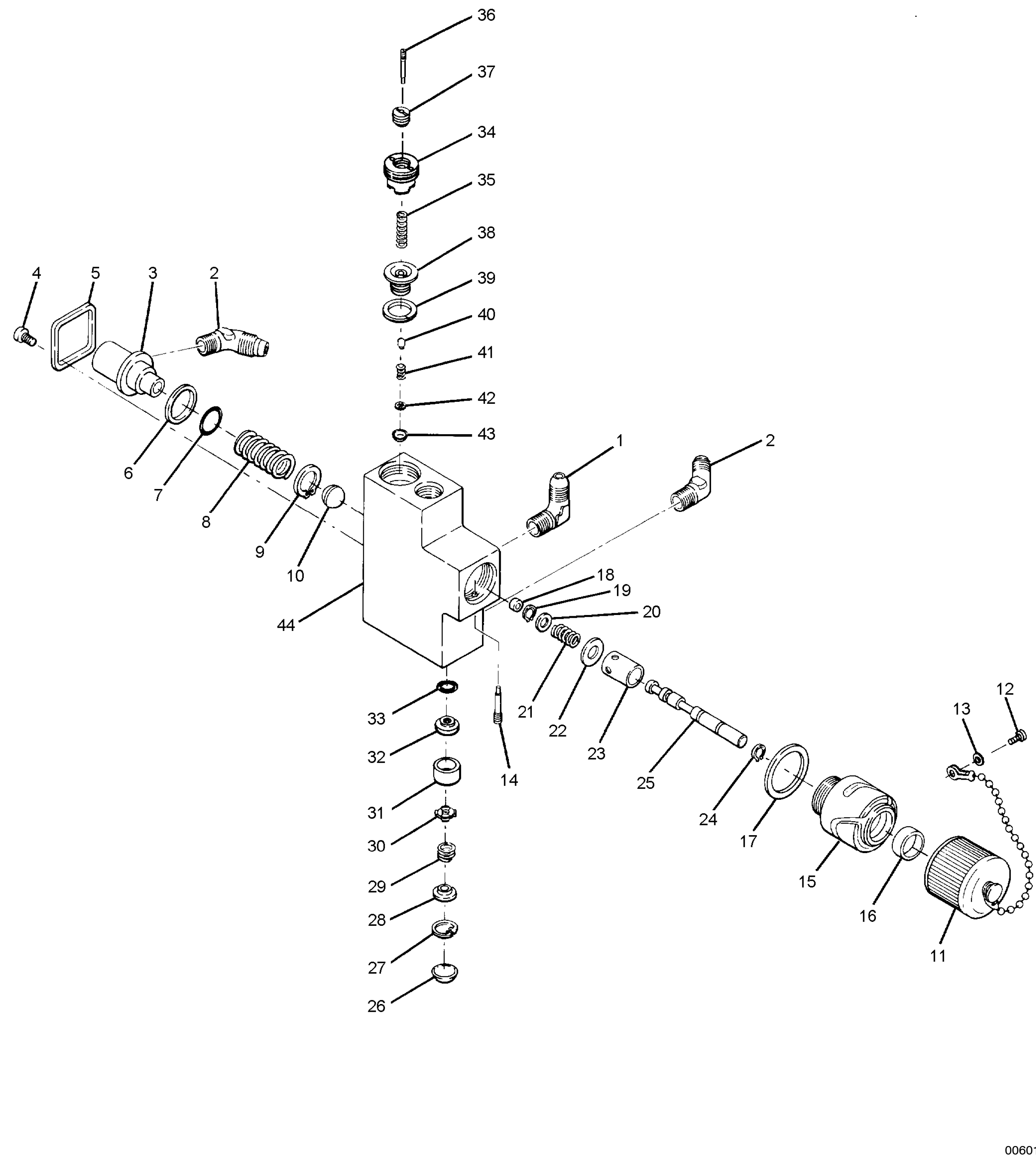

Figure 6-13. Combination Valve Assembly

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
6-13	1620660-1	VALVE ASSEMBLY, Combination . . . . (figure 6-12 for NHA)	REF	
-1	MS20822-5D	. ELBOW	1	
-2	MS20823-5D	. ELBOW	1	
-3	1620659-1	. SEAT, Build Up . . . . (ATTACHING PARTS)	1	
-4	MS35233-27	. SCREW, Machine, pan head	4	
-5	1620654-1	. SPACER, Clamping (KD) . . . . ---*---	1	
-6	1603661-69	. WASHER, Nonmetallic (KD)	1	
-7	1602321-35	. PACKING, Preformed (KD)	1	
-8	815404	. SPRING, Helical Compression (KD) . . . . (CAGE 99251)	1	
-9	MS16626-4050	. RING, Retainer, external	1	
-10	1620663-1	. BALL, Valve (KD)	1	
-11	MS27566-1	. CAP ASSEMBLY, Fill Valve, LOX . . . . (ATTACHING PARTS)	1	
-12	MS35233-27	. SCREW, Machine, pan head	1	
-13	AN960C6L	. WASHER, Flat . . . . ---*---	1	
-14	MBFS404SCP	. SETSCREW, Bristo	1	
-15	1620304-1	. HEAD, Filler	1	
-16	1602412-1	. INSERT, Filler Head	1	
-17	1620305-1	. GASKET	1	
-18	816919-14	. PACKING, Preformed (KD)	1	
-19	MS16624-4025	. RING, Retaining, external	1	
-20	1603660-123	. WASHER, Flat (KD)	1	
-21	1611448-1	. SPRING, Helical Compression (KD)	1	
-22	1603660-113	. WASHER, Flat (KD)	1	
-23	1611449-1	. SLEEVE, Plunger	1	
-24	MS16624-4025	. RING, Retaining, external	1	
-25	1620656-1	. SHAFT	1	
-26	778488-5	. PLUG, Expansion (KD)	1	
-27	MS16625-4056	. RING, Retaining, internal	1	
-28	1600818	. WASHER, Spring Guide	1	
-29	815395	. SPRING, Helical Compression (KD)	1	
-30	1600820	. HEAD, Valve Check (KD)	1	
-31	1616784-1	. SLEEVE, Hold Down	1	
-32	1600821	. SEAT, Check Valve (KD)	1	
-33	813752	. PACKING, Preformed (CAGE 99251)	1	
-34	1620550-1	. RETAINER	1	
-35	1613622-1	. SPRING, Helical Compression (KD)	1	
-36	1620657-1	. STOPSCREW	1	
-37	1620658-1	. SCREW, Adjusting	1	
-38	1613617-1	. BELLOWS ASSEMBLY	1	
-39	1613610-1	. GASKET (KD)	1	

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
6-13-40	1613614-1	. VALVE (KD)	1	
-41	1613616-1	. SPRING, Helical Compression, sealing (KD)	1	
-42	1620570-1	. SCREEN, Filter (KD)	1	
-43	1620655-1	. CUP, Spring (KD)	1	
-44	1620606-1	. HOUSING, Combination Valve	1	

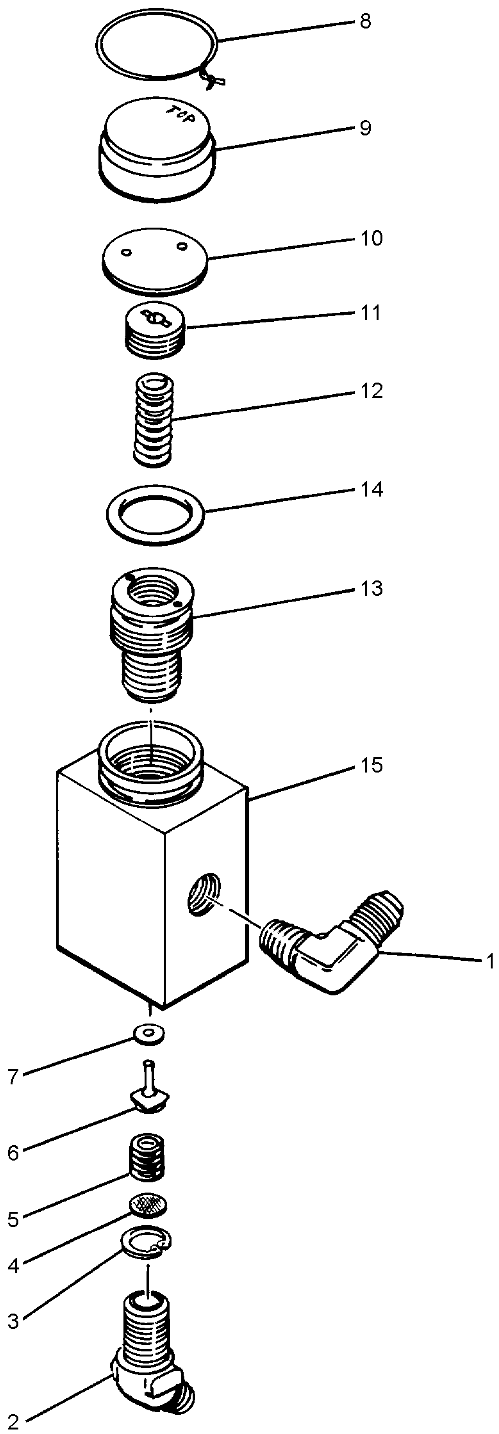

Figure 6-14. Pressure Closing Valve Assembly

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
6-14	1616733-1	VALVE ASSEMBLY, Pressure Closing . . . . (figure 6-12 for NHA)	REF	
-1	MS20822-5D	. ELBOW	1	
-2	823-5-4D	. ELBOW (CAGE 70195) . . . . (Note 1)	1	
-3	MS16625-4037	. RING, Retaining, internal	1	
-4	815634-7	. FILTER (CAGE 99251)	1	
-5	1616732-1	. SPRING, Helical Compression	1	
-6	1616730-1	. STEM	1	
-7	1616728-1	. DISC	1	
-8	MS20995C32	. LOCKWIRE	A/R	
-9	1611857-1	. COVER	1	
-10	1611319-1	. DISC, Cupped	1	
-11	1616788-1	. SCREW, Spring Adjusting	1	
-12	815735	. SPRING, Helical Compression . . . . (CAGE 99251)	1	
-13	1616790-1	. BELLOWS ASSEMBLY	1	
-14	815743	. PACKING, Preformed	1	
-15	1616697-1	. HOUSING, Pressure Closing Valve	1	
	Notes: 1. Bendix P/N 812787-9.			

NUMERICAL INDEX

Part Number	Figure and Index Number	SM&R Code
AN515C8-6	6-12-22	PAOZZ
AN525-832-6	6-12-30	PAOZZ
AN816-5D	6-12-26	PAOZZ
AN916-1D	6-12-3	PAOZZ
AN929-5	6-12-1	PAOZZ
AN960C6L	6-13-13	PAOZZ
CL227C2-1	6-12-49	
C14938SS832	6-12-24	PAGZZ
	6-12-33	
JP22E	6-12-17	PAGZZ
MBFS404SCP	6-13-14	
MS16624-4025	6-13-19	PAOZZ
	6-13-24	
MS16625-4037	6-13-3	PAOZZ
MS16625-4056	6-13-27	PAOZZ
MS16626-4050	6-13-9	PAOZZ
MS20365-440	6-12-39	PAGZZ
MS20822-5D	6-13-1	PAOZZ
	6-14-1	
MS20823-5D	6-12-47	PAOZZ
	6-13-2	
MS20825-5D	6-12-2	PAOZZ
MS20995C32	6-12-4	PAOZZ
	6-14-8	
MS21045C4	6-12-12	
MS22068-4	6-12-46	PAOZZ
MS22068-6	6-12-40	PAOZZ
MS24693C27	6-12-45	PAOZZ
MS24693C49	6-12-42	PAOZZ
MS24693C6	6-12-37	PAOZZ
MS24694C115	6-12-9	
MS27566-1	6-13-11	PAOZZ
MS35233-27	6-13-4	PAOZZ
	6-13-12	
MS35489-10S	6-12-5	
NTNO-4SCP	6-12-16	PAOZZ
RO-405SS	6-12-15	PAOZZ
WO-8SS	6-12-23	PAOZZ
	6-12-31	
1-606-1	6-12-13	PAOZZ
1-606-2	6-12-14	
104002	6-12-25	PAOZZ
1600482-1	6-12-34	
1600818	6-13-28	PAGZZ
1600820	6-13-30	PAGZZ
1600821	6-13-32	
1601217-1	6-12-50	

Part Number	Figure and Index Number	SM&R Code
1602321-17	6-12-43	PAGZZ
1602321-35	6-13-7	PAGZZ
1602412-1	6-13-16	PAOZZ
1603660-113	6-13-22	PAOZZ
1603660-123	6-13-20	
1603660-38	6-12-10	PAGZZ
1603661-69	6-13-6	PAGZZ
1611319-1	6-14-10	PAGZZ
1611420-1	6-12-19	
1611421-1	6-12-20	
1611428-2	6-12-27	PAOZZ
1611433-1	6-12-38	PAOZZ
1611434-1	6-12-32	PAGZZ
1611448-1	6-13-21	PAGZZ
1611449-1	6-13-23	PAGZZ
1611453-1	6-12-29	PAOZZ
1611857-1	6-14-9	PAGZZ
1613610-1	6-13-39	PAGZZ
1613614-1	6-13-40	
1613616-1	6-13-41	PAGZZ
1613617-1	6-13-38	PAGZZ
1613622-1	6-13-35	PAGZZ
1616648-1	6-12-50	
1616697-1	6-14-15	
1616728-1	6-14-7	PAGZZ
1616730-1	6-14-6	PAGZZ
1616732-1	6-14-5	PAGZZ
1616733-1	6-12-44	
	6-14	
1616742-1	6-12-6	
1616784-1	6-13-31	PAGZZ
1616788-1	6-14-11	PAGZZ
1616790-1	6-14-13	PAGZZ
1616833-1	6-12-48	
1616834-1	6-12-35	
1620304-1	6-13-15	
1620305-1	6-13-17	
1620550-1	6-13-34	PAGZZ
1620570-1	6-13-42	PAGZZ
1620606-1	6-13-44	
1620654-1	6-13-5	
1620655-1	6-13-43	PAGZZ
1620656-1	6-13-25	PAOZZ
1620657-1	6-13-36	PAGZZ
1620658-1	6-13-37	PAOZZ
1620659-1	6-13-3	PAOZZ
1620660-1	6-12-41	PAOGG

NUMERICAL INDEX (Cont)

Part Number	Figure and Index Number	SM&R Code
1620660-1	6-13	PAOGG
1620661-1	6-12-7	
1620663-1	6-13-10	PAGZZ
1622347-1	6-12-28	PAGZZ
1622347-2	6-12-11	PAGZZ
1623329-1	6-12-21	
1623334-1	6-12-8	
1626449-1	6-12-36	PAOZZ
29073-D2	6-12	PAOGD
6690-1	6-12-18	PAOZZ

Part Number	Figure and Index Number	SM&R Code
778488-5	6-13-26	PAGZZ
813752	6-13-33	
815395	6-13-29	PAGZZ
815404	6-13-8	PAGZZ
815634-7	6-14-4	PAGZZ
815735	6-14-12	PAGZZ
815743	6-14-14	PAGZZ
816919-14	6-13-18	PAGZZ
823-5-4D	6-14-2	PAOZZ

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CHAPTER 7

LIQUID OXYGEN CONVERTER ASSEMBLY

TYPE GCU-24/A, P/Ns 21170-10 AND 21170-13

Section 7-1. Description

7-1. GENERAL.

7-2. The Liquid Oxygen Converter Assembly, Type GCU-24/A, P/Ns 21170-10/-13, (figure 7-1) is manufactured by Carleton Technologies Inc., formerly ARO Corporation (CAGE 03990). The converter assembly is designed to store and convert liquid oxygen (LOX) into gaseous oxygen for the aircrewmember during flight. Table 7-1 contains the leading particulars for the converter assembly.

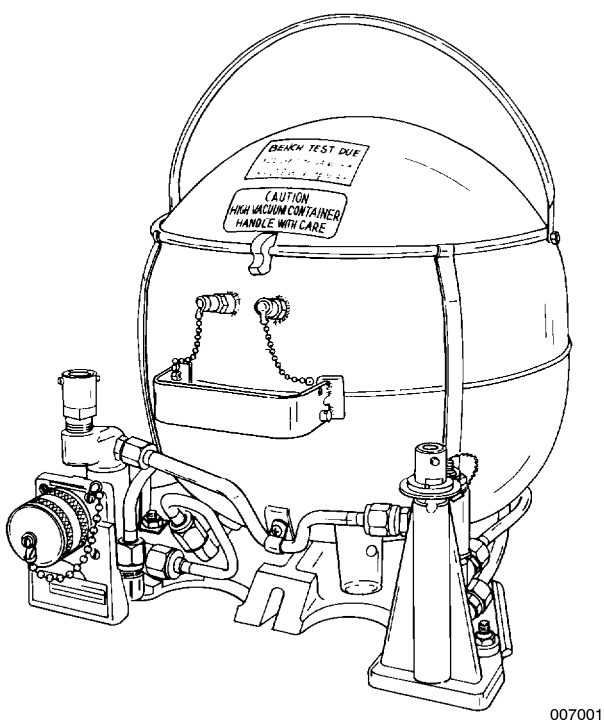


Figure 7-1. Liquid Oxygen Converter Assembly, Type GCU-24/A, P/Ns 21170-10/-13

Table 7-1. Leading Particulars

Capacity (LOX)	10 liters
Operating pressure	55 to 90 psig
Operating temperature range	-65°F (-54°C) to +260°F (+127°C)
Relief valve setting	100 to 120 psig
Pressure Control valve setting	55 to 90 psig
Delivery rate	120 lpm (min)
Filling time at 70°F	10 min
Buildup time (max)	5 min

7-3. Oxygen in its liquid state (approximately -297°F (-182°C)), is stored in a spherical assembly consisting of inner and outer shells separated by an annular space. The annular space is evacuated, creating a vacuum, preventing the transmittal of heat through the space. The thermos bottle effect created retards heating and eventual conversion of LOX to gaseous oxygen. Valves, tubing, and fittings incorporated in the converter assembly convert LOX to gas and direct its flow at a controlled rate.

7-4. CONFIGURATION.

7-5. The Liquid Oxygen Converter Assembly, Type GCU-24/A, P/Ns 21170-10/-13, consists of a container assembly, fill, buildup, and vent valve with relief valve incorporated, pressure control valve, and associated tubing and fittings. A capacitance-type probe assembly, which sends an electrical signal to a liquid oxygen quantity gage located in the aircraft, is incorporated within the container assembly. The quantity gage indicates the amount of LOX, in liters, contained in the converter.

7-6. FUNCTION.

7-7. Operational characteristics and performance for which the GCU-24/A converter assembly (P/Ns 21170-10/-13) are designed are as follows:

1. Filling the converter is accomplished by attaching the LOX servicing trailer filler valve to the filler port of the fill, buildup, and vent valve on the converter. When attached, the servicing trailer filler valve depresses the nosepiece and valve poppet of the fill, buildup, and vent valve. This automatically puts the converter into the fill mode (figure 7-2).

2. With the poppet depressed, fill and vent ports of the fill, buildup, and vent valve are opened and the buildup port is closed. This condition allows gas pressure built up in the inner container to vent to the atmosphere. As pressure is vented, LOX in the servicing trailer (which is at a greater pressure (30 psig)), flows through the fill, buildup, and vent valve and into the converter.

3. As the LOX level rises in the container, pressure created by vaporization of liquid due to heat, turbulence, etc, is vented to the atmosphere. The converter is considered full when LOX flows in a steady stream from the overboard vent line quick-disconnect coupling.

4. When the converter is full and the servicing trailer filler valve is disconnected, the nosepiece and poppet of the fill, buildup, and vent valve returns to the extended position (figure 7-3). This automatically puts the converter into the buildup and supply mode. In this mode, the fill and vent ports are closed and the buildup port is open.

5. In the buildup and supply mode, LOX is forced out of the bottom of the inner container and into the buildup coil by the weight of the liquid (figure 7-3). As the LOX warms and vaporizes into gaseous oxygen in the buildup coil, pressure is created. This pressure is controlled at approximately 75 psig by the opening and closing action of the pressure control valve.

6. Gaseous oxygen travels from the buildup coil through the supply quick-disconnect coupling assembly and the heat exchanger to a shut-off valve in the aircraft cockpit.

7. Gaseous oxygen, under pressure, also passes through the gas and buildup ports of the fill, buildup, and vent valve to the upper portion of the pressure control valve. A bellows, inside the pressure control valve, holds the valve in the open position. As pressure builds, the bellows senses the increase, contracts (at approximately 75 psig), and closes the valve.

8. Without a demand being placed on the converter, pressure continues to slowly rise. If allowed to go unchecked, pressure in excess of 12,000 psig could be generated. To prevent this potentially hazardous situation, a relief valve is incorporated. The relief valve is set to relieve excess pressure in the converter assembly at approximately 110 psig.

9. As a demand is placed on the converter by the aircrewmember, LOX is forced into the buildup coil to replace consumed oxygen. As this process is repeated, the LOX level in the converter drops, increasing the void area at the top. As the size of the void area increases, pressure decreases and is sensed by the bellows in the pressure control valve. When pressure falls below approximately 75 psig, the bellows expands, opening the valve. With the valve open, pressure from the buildup coil passes through the valve and into the top of the converter. This pressure, coupled with the pressure created by vaporizing LOX contained in the converter, again builds to approximately 75 psig and closes the pressure control valve. This process is repeated as long as a demand is being placed on the converter.

10. A heat exchanger is incorporated into the aircraft tubing to further warm the gaseous oxygen to a breathable temperature.

11. An additional relief valve, set at approximately 115 psig, is installed in the aircraft oxygen plumbing to provide additional protection against overpressurization of the converter and supply lines of the system.

7-8. SERVICE LIFE.

7-9. Liquid oxygen converters shall remain in service as long as they continue to function properly.

7-10. REFERENCE NUMBERS, ITEMS AND SUPPLY DATA.

7-11. Section 7-5, Illustrated Parts Breakdown, contains information on the converter assembly, subassemblies, and component parts. Figure and index numbers, reference or part numbers, description, and units per assembly are provided with the breakdown.

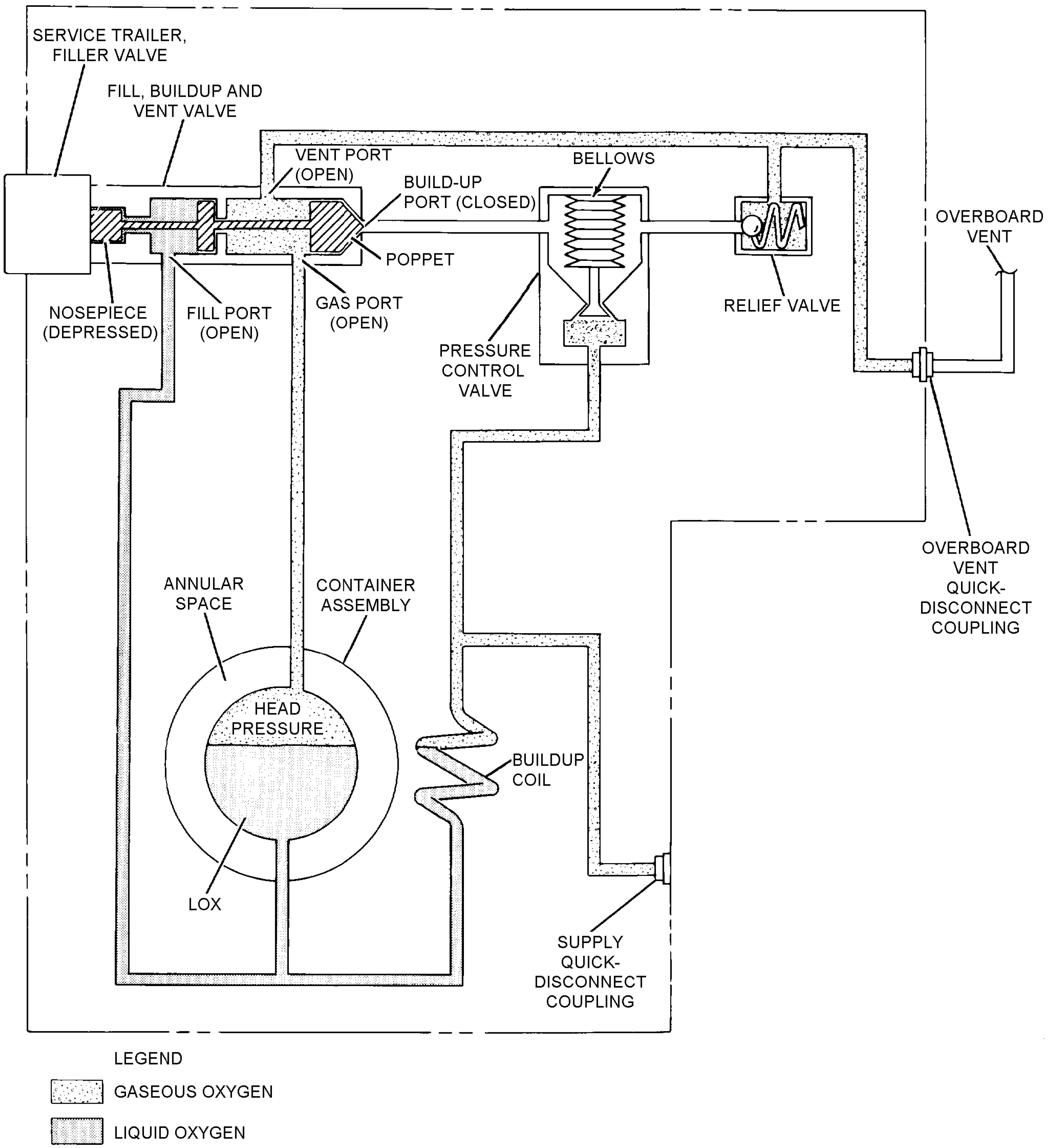


Figure 7-2. Fill Mode (Converter Removed from Aircraft)

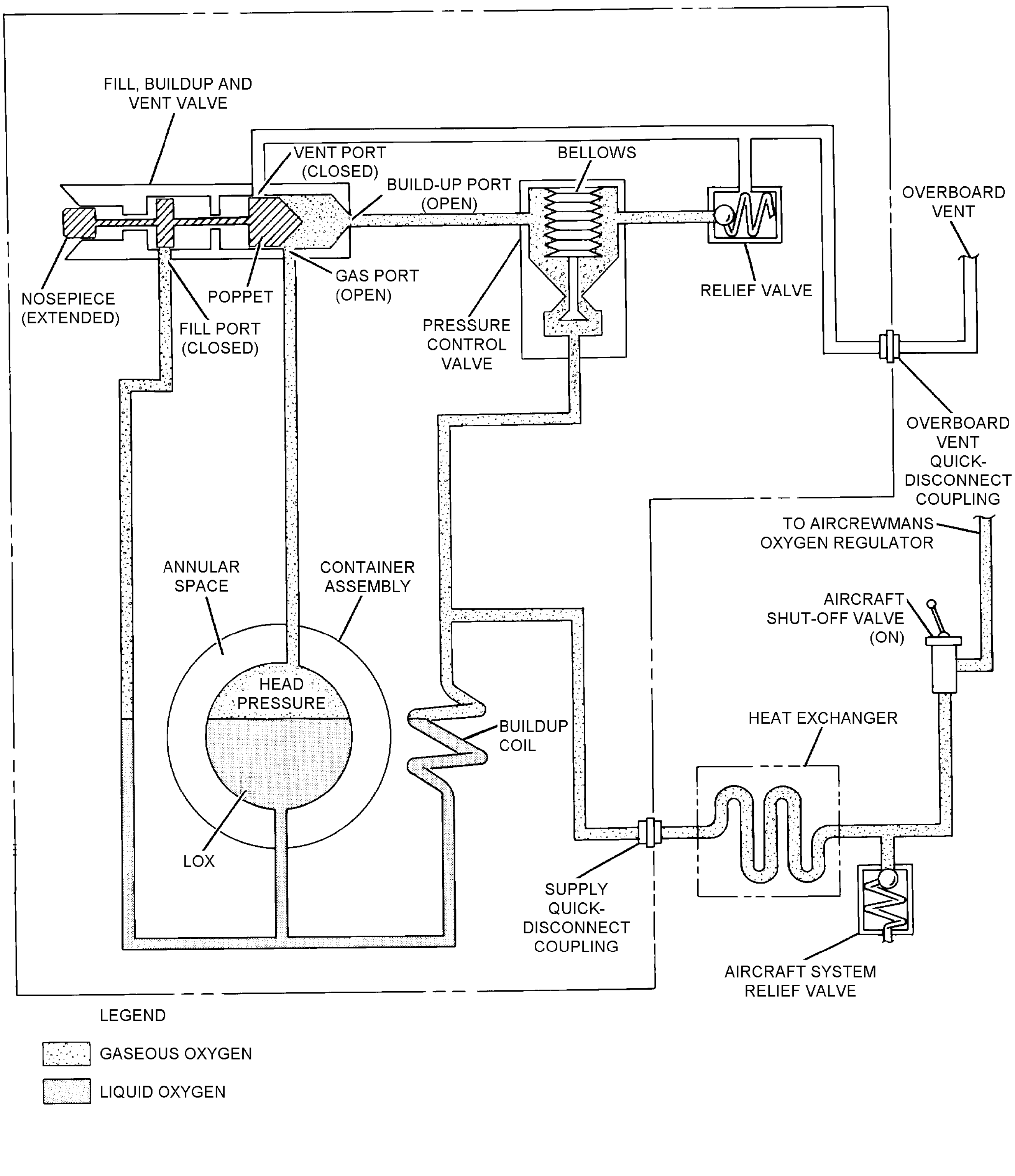


Figure 7-3. Buildup and Supply Mode (Converter Installed)

Section 7-2. Modifications

7-12. GENERAL.

7-13. There are no modifications to the GCU-24/A, P/Ns 21170-10/-13, required/authorized at this time.

Section 7-3. Performance Test Sheet Preparation

7-14. GENERAL.

7-15. Preparation of the Liquid Oxygen Converter Performance Test Sheet utilized during bench test requires entering the appropriate indicated flows and pressures in the spaces provided (figure 7-4). The indicated flows and pressures shall be extracted from the test stand calibration correction cards. Refer to appropriate ground support equipment manual.

7-16. The test stand calibration correction cards contain all actual flows and pressures required to test all known models of liquid oxygen converters presently in service. Converting actual flows and pressures to indicated flows and pressures is normally accomplished during calibration of the test stand. Refer to appropriate ground support equipment manual for calibration intervals.

7-17. The Performance Test Sheet shall be prepared as shown in figure 7-4. The Performance Test Sheet shown is a sample but can be reproduced for local use.

7-18. The following tests require the extraction of appropriate indicated flows and/or pressures from the test stand calibration correction cards:

1. Relief Valve Test
2. Converter Leakage Test
3. Fill and Buildup Time Test
4. Flow Test
5. Converter Charge

NOTE

Correction card numbers refer to appropriate ground support equipment manual.

7-19. CONVERTER PERFORMANCE TESTS.

7-20. RELIEF VALVE TEST. The relief valve shall vent at least 100 liters per minute (lpm) with an applied pressure of 100 to 120 psig. The maximum allowable leakage with 95 psig applied is 0.01 lpm. Make the following entries on the Performance Test Sheet:

1. Locate the indicated inches of water (inH_2O) for 100 lpm on correction card number 4. Enter indicated inH_2O in space provided on Performance Test Sheet.

2. Locate the indicated psig for the actual pressures of 95, 100, and 120 psig on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

3. Locate the indicated inH_2O for the actual flow of 0.01 lpm on correction card number 7. Enter the indicated inH_2O in space provided on Performance Test Sheet.

7-21. CONVERTER LEAKAGE TEST. The Converter Leakage Test is performed with the converter pressurized with gaseous oxygen to 95 psig. Locate the indicated psig for the actual 95 psig on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

PERFORMANCE TEST SHEET
TYPE GCU-24/A LIQUID OXYGEN CONVERTER ASSEMBLY
(THE ARO CORPORATION P/Ns 21170-10/-13)

DATE: ____________ CONVERTER SERIAL NO: ____________ TEST STAND SERIAL NO: ____________

OPERATOR: ____________ CDI: ____________ TARE WEIGHT: ____________

1. CONVERTER PURGE (PURGE 60 MINUTES AT 200°F (93°C) TO 250°F (121°C) AND AT 120 PSIG).

2. INSULATION RESISTANCE TEST (EMPTY).

CONNECTION	MINIMUM ALLOWABLE MEGOHMS	READING
A TO B	2.0	
A TO GROUND	1.0	
B TO GROUND	1.0	

3. CAPACITANCE TEST (EMPTY) READING SHALL BE 121.5 TO 125.5 MICROMICROFARADS (UUF) ____________

4. RELIEF VALVE TEST

VENT FLOW						LEAKAGE					
INLET PRESS (PSIG)			FLOW			INLET PRESS (PSIG)			FLOW		
ACTUAL	INDICATED	PG-1 READING	ACTUAL (LPM)	INDICATED (INH_2O)	PG-2 READING	ACTUAL	INDICATED	PG-1 READING	ACTUAL (LPM)	INDICATED (INH_2O)	PG-2 READING
100			100			95			0.01		
120											

5. CONVERTER LEAKAGE TEST

95 PSIG ACTUAL = ____________ PSIG INDICATED, WITH INDICATED PSIG APPLIED THERE SHALL BE NO LEAKAGE FROM THE PRESSURE CONTROL VALVE, BUILDUP COIL, TUBING AND FITTINGS.

6. FILL AND BUILDUP TIME TEST

A. FILL TIME (MAXIMUM TIME ALLOWED IS 10 MINUTES) ____________

B. BUILDUP TIME (MAXIMUM TIME TO BUILDUP TO 55 TO 90 PSIG IS 5 MINUTES) PSIG ACTUAL = ________ PSIG INDICATED TIME REQUIRED FOR BUILDUP ________ MINUTES.

7. CAPACITANCE TEST (FULL)

TOTAL CONVERTER WEIGHT	
CONVERTER TARE WEIGHT	
LOX WEIGHT (W)	
2.33 X W + 124.7 = C (MAX)	
2.25 X W + 122.3 = C (MIN)	
READING	
C = CAPACITANCE IN UUF	W = WEIGHT OF LOX IN POUNDS

Figure 7-4. Converter Performance Test Sheet (Sheet 1 of 2)

8. FLOW TEST (120 LPM WHILE MAINTAINING 55 TO 90 PSIG WORKING PRESSURE)

WORKING PRESS. (PSIG)		FLOW (LPM)		PG-2 READING
ACTUAL	PG-1 INDICATED	ACTUAL	INDICATED	
55		120		
90				

9. EVAPORATION LOSS TEST (BUILDUP AND SUPPLY MODE) MAXIMUM ALLOWABLE LOSS OF LOX IN 24 HOURS IS 3.0 LBS.

NOTE: LOX IN CONVERTER MUST BE STABILIZED FOR 1 HOUR PRIOR TO BEGINNING TEST. DO NOT AGITATE CONVERTER DURING 24 HOUR PERIOD.

A. START TIME ____________________ START WEIGHT ____________________

B. FINISH TIME ____________________ FINISH WEIGHT ____________________

10. EVAPORATION LOSS TEST (VENTED MODE)
MAXIMUM ALLOWABLE LOSS OF LOX IN 24 HOURS IS 5.0 LBS. (PERFORMED ONLY IF CONVERTER FAILS EVAPORATION LOSS TEST IN BUILDUP AND SUPPLY MODE)

A. START TIME ____________________ START WEIGHT ____________________

B. FINISH TIME ____________________ FINISH WEIGHT ____________________

11. CONVERTER CHARGE (OXYGEN)

PRESSURE (PSIG)		
ACTUAL	INDICATED	READING
25		
30		

Figure 7-4. Converter Performance Test Sheet (Sheet 2 of 2)

7-22. FILL AND BUILDUP TIME TEST. The time required to fill the converter (10 liters) shall not exceed 10 minutes at a filling pressure of 30 psig.

7-23. The time required for the filled converter to build up a working pressure of 55 to 90 psig shall not exceed 5 minutes from time the servicing trailer filler valve is disconnected from converter. Locate indicated psig for the actual psig pressure on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

7-24. FLOW TEST. The converter shall be capable of delivering gaseous oxygen at the rate of 120 lpm while maintaining pressure of 55 to 90 psig. Make the following entries on the Performance Test Sheet:

1. Locate the indicated inH_2O for the actual flow of 120 lpm on correction card number 4. Enter indicated inH_2O in space provided on Performance Test Sheet.

2. Locate the indicated psig for actual pressures of 55 to 90 psig on correction card number 2. Enter actual psig in spaces provided on Performance Test Sheet.

7-25. CONVERTER CHARGE. Upon completing the Bench Test, the converter shall be emptied of LOX and pressurized with gaseous oxygen 25 to 30 psig. This prevents moisture from entering the converter during shipment/storage. Locate indicated psig for the actual pressures of 25 to 30 psig on correction card number 2. Enter indicated psig in spaces provided on Performance Test Sheet.

Section 7-4. Maintenance

7-26. GENERAL.

7-27. This Section contains the procedural steps for inspecting, testing, troubleshooting, disassembly, cleaning, repair, assembly, and adjusting of the Liquid Oxygen Converter Assembly, Type GCU-24/A (P/Ns 21170-10/-13).

NOTE

Upon completion of any maintenance action (e.g., inspection, repair, modification, etc), be sure to complete the required Maintenance Data Collection System forms.

7-28. EMERGENCY PRESSURE RELIEF PROCEDURES. When filling the converter, or at any time, if any of the following situations are encountered: Heavy frosting, icing, or excessive pressure buildup (in excess of 130 psig), perform the following immediately.

WARNING

LOX in a non-vented container will build to 12,000 psig. Converters however, will explode at approximately 1,200 psig.

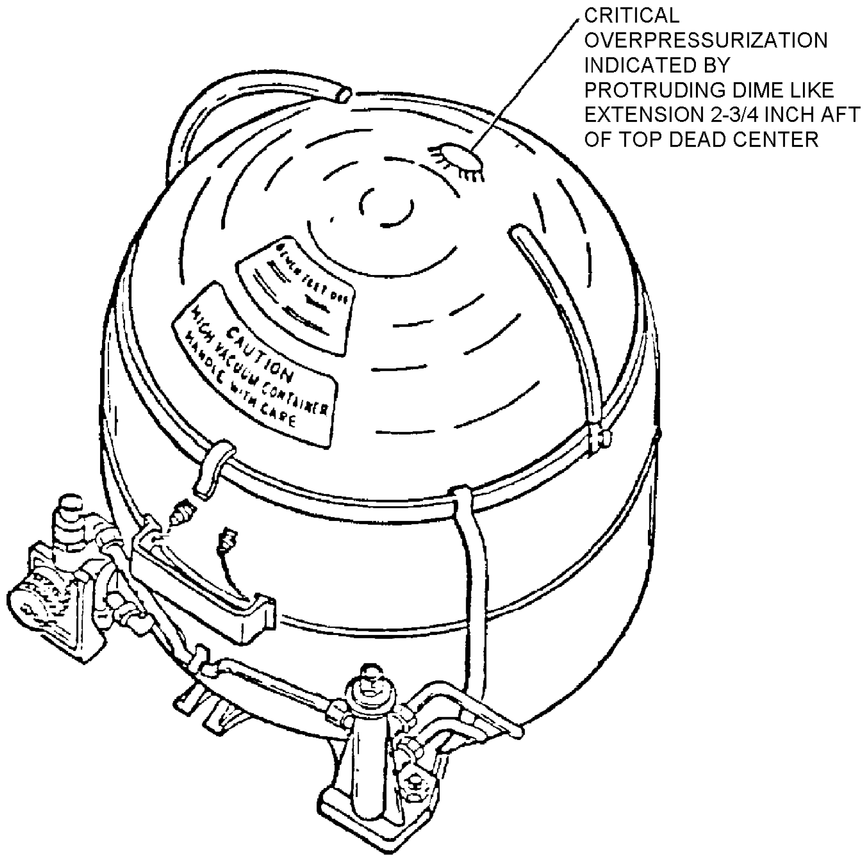
Do not attempt to relieve pressure in LOX converters that indicate critical overpressurization (figure 7-5). For these converters, comply with procedures as prescribed in the individual station/ships emergency procedures bill.

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Fixture, Test, Valve, Gage/ Relief, Pressure	Fabricate IAW figure 7-6
1	Line, Drain, Port, Vent	Fabricate IAW figure 7-7
1	Line, Drain, Converter, LOX	Fabricate IAW figure 7-8

1. After filling is completed attach pressure gage/ relief valve test fixture (figure 7-6) to supply quick-disconnect coupling (56).

2. Attach vent port drain line (figure 7-7) to converter vent port coupling (36). Ensure vent port drain line faces away from operator.



007005

Figure 7-5. Critically Overpressurized ARO LOX Converter, P/Ns 21170-10/-13

3. Ensure adapter knurl knob is backed out counterclockwise.

WARNING

When performing step 4, if excessive pressure does not relieve through vent port drain immediately comply with procedures as prescribed in the individual station/ships emergency procedures bill.

4. Install adapter to the fill port of fill, buildup, and vent valve (44) and relieve pressure from the converter by turning the knurl knob of the adapter clockwise four full turns (this places the converter in the vented mode).

5. Observe the pressure gage/relief valve test fixture until 70 psig is indicated.

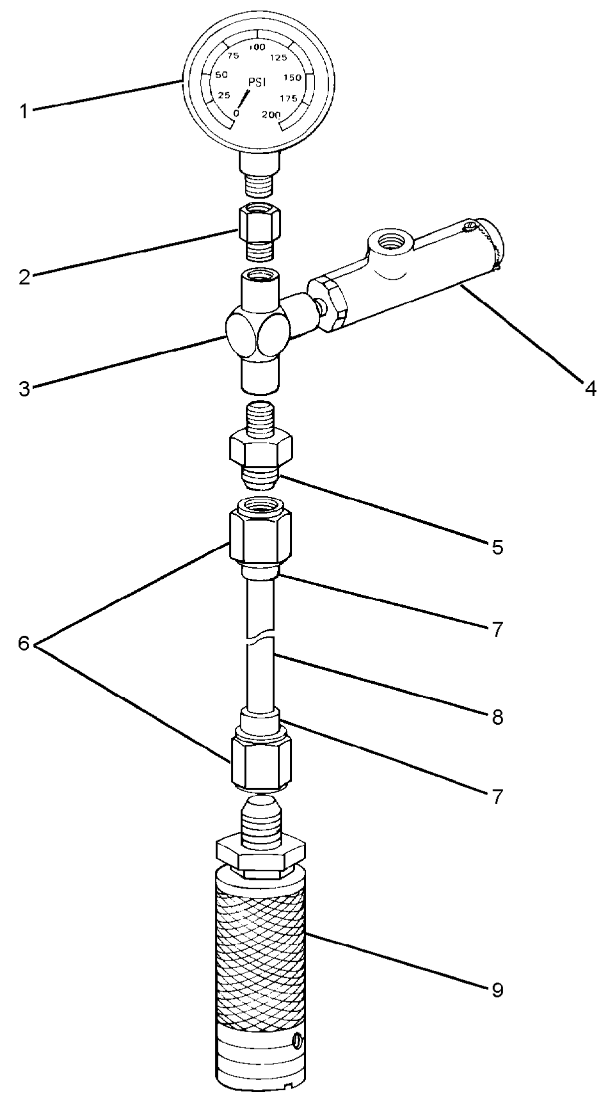
6. Remove pressure gage/relief valve test fixture and adapter.

WARNING

When performing step 7, if LOX fails to drain from the converter, disconnect LOX converter drain line, attach adapter to fill, buildup, vent valve (44) and turn knurl knob clockwise 4 full turns. (Organizational Level transport defective converter to AIMD immediately).

7. Immediately place converter in a LOX drain pan, attach LOX converter drain line (figure 7-8) to supply quick-disconnect coupling (56) and drain LOX from the converter.

8. Organizational Level forward the defective LOX converter to AIMD for Bench Test.

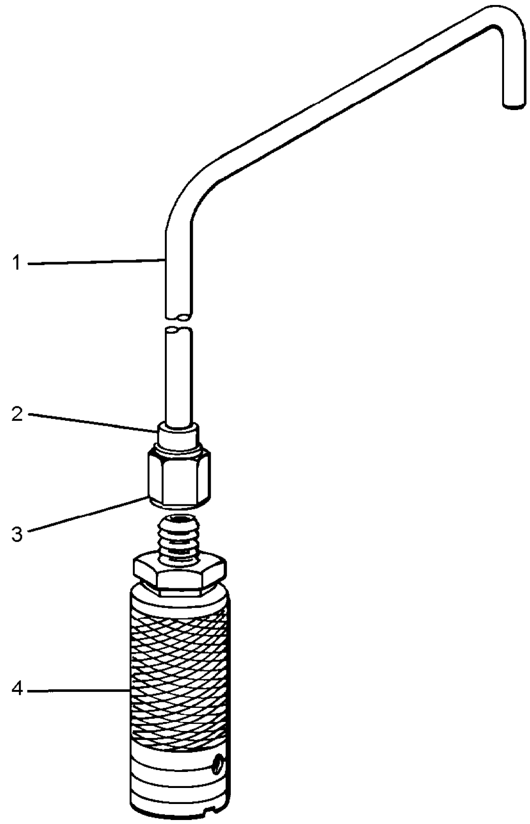


ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY INSTRUCTIONS
1	200 PSI Oxygen Gage	P/N 100204-18 (CAGE 42527) NIIN 00-961-1990	Anti-seize tape required (Note 1)
2	1/4 to 1/8 in. Reducer, Pipe	P/N 3200X4X2 (CAGE 79470)	Anti-seize tape required
3	Pipe Tee	AN917-1	—
4	Relief Valve	P/N 20C-0005-20 (CAGE 19062) MIL-V-9050D P/N 20C-0050-2	Adjust to relieve at 135 ± 5 psig and flow a minimum of 100 lpm. (Note 1) Anti-seize tape required
5	Male Connector	AN816-5D	Anti-seize tape required
6	Tubenut	AN818-5	2 required
7	Tube Sleeve	MS20819-5	2 required
8	Flared Aluminum 6061-T6 Tube (5/16″ O.D. Dia)	—	Cut length 2 1/2 to 3 1/2 in.
9	Supply Quick-disconnect Coupling	MS22608-7 P/N 199000-1 (CAGE 83533)	—

Notes: 1. The Pressure Gage/Relief Valve Test Fixture shall be forwarded to AIMD for relief valve setting, flow test, and leakage test (same as converter relief valve test only higher setting). The 200 PSI Oxygen Gage shall be calibrated in accordance with the metrology and calibration (METCAL) program.

007006

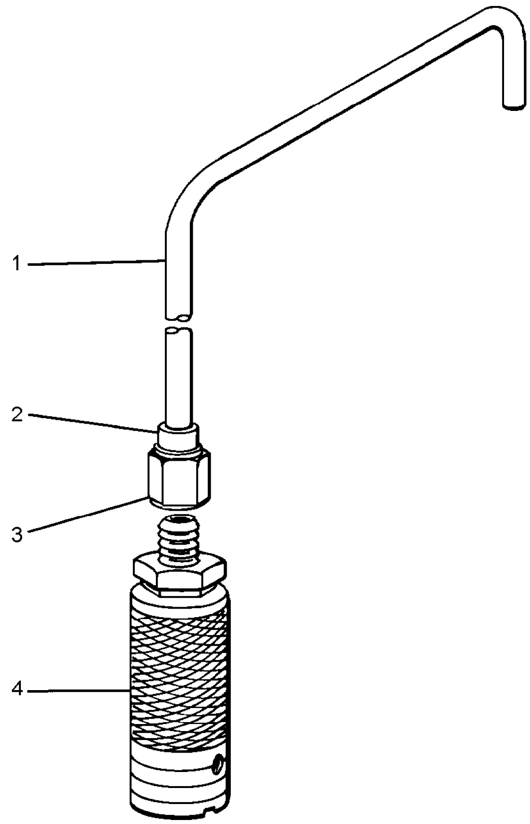
Figure 7-6. Pressure Gage/Relief Valve Test Fixture



ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY INSTRUCTIONS
1	Flared Aluminum 6061-T6 Tube (1/2 O.D. Dia)	—	Cut to 14-inches; bend as shown above
2	Tube Sleeve Coupling	MS20819-5	—
3	Tubenut	AN818-8	—
4	Half Coupling Quick-Disconnect	2560000-1 (CAGE 83533)	—

007007

Figure 7-7. Vent Port Drain Line



ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY INSTRUCTIONS
1	Flared Aluminum 6061-T6 Tube (5/16″ O.D. Dia)	—	Cut to 14-inch length; bend as desired
2	Tube Sleeve	MS20819-5	—
3	Tubenut	AN818-5	—
4	Quick-Disconnect Coupling	MS22068-7 P/N 199000-1 (CAGE 83533)	—

007008

Figure 7-8. LOX Converter Drain Line

7-29. INSPECTION.

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical over-pressurization, immediately comply with the emergency pressure relief procedures given in paragraph 7-28 at the beginning of this section.

7-30. ACCEPTANCE/TURNAROUND/DAILY/PREFLIGHT/POSTFLIGHT AND TRANSFER INSPECTIONS. The Acceptance/Turnaround/Daily/Preflight/Postflight and Transfer Inspections consist of a Visual Inspection followed by a Functional Test. These inspections and tests shall be performed in conjunction with the aircraft inspection requirements for the aircraft in which the converter is installed. Refer to table 7-2 for troubleshooting assistance.

NOTE

Charge the converter in accordance with paragraph 7-53; ensuring strict compliance with all steps, especially steps 5 and 6.

7-31. Any liquid oxygen converter which does not pass the Visual Inspection or Functional Test shall be removed from the aircraft, drained immediately, and replaced by a Ready For Issue (RFI) liquid oxygen converter. To drain the liquid oxygen converter, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Line, Drain, Converter, LOX	Fabricate IAW figure 7-8

NOTE

If no LOX converter drain line is available, fabricate one in accordance with figure 7-8.

1. Place converter in a LOX drain pan in an area free from dirt and hydrocarbons.

WARNING

Ensure that draining LOX is directed away from all personnel.

2. Attach drain line (figure 7-8) to converter supply quick-disconnect coupling, which will immediately begin draining converter.

3. Contact Maintenance Control for action to be taken.

7-32. Visual Inspection. Visually inspect the converter assembly and surrounding area for the following:

WARNING

When working with oxygen, make certain that clothing, tubing fittings, and equipment are free of oil, grease, fuel, hydraulic fluid, or any combustible liquid. Fire or explosion can result when even slight traces of combustible material come in contact with oxygen under pressure.

1. Freedom from dirt and hydrocarbons.

2. Correct installation and positioning of all components.

3. Presence and condition of Glyptal dots on relief valve and pressure closing valve.

4. Legibility of all markings.

5. Cracks, dents, or other damage to tubing, valves, and electrical connections.

6. Corrosion on converter assembly and surrounding areas.

7. Obstructions in aircraft overboard vent line.

8. Security of supply, vent, and electrical quick-disconnects.

9. Excessive frosting and/or continuous venting of converter assembly.

10. Ensure that date on converter bench test decal is current (within last 231 days).

Table 7-2. Troubleshooting (Acceptance/Turnaround/Daily/Preflight/Postflight and Transfer Inspections)

Trouble	Probable Cause	Remedy
Converter will not fill.	Ice in filler valve or filler obstructs LOX flow.	Thaw filler valve or filler line.
Converter does not fill in required time.	Filler line not properly purged prior to filling.	Purge and cool filler line.
	Converter not sub-cooled before filling.	Lower pressure in servicing trailer and sub-cool converter.
	Filling pressure too low.	Set fill pressure in accordance with servicing trailer operating instructions.
	Defective converter.	Replace converter with RFI converter.
Frost collects on entire outer jacket of converter.	Heat loss due to annular space leakage.	Replace converter with RFI converter.
Converter will fill only partially (gas only emitted from vent).	Converter not sub-cooled prior to filling.	Lower pressure in servicing trailer and sub-cool converter.
System will not build up.	Combination valve defective or partially open.	Replace converter, or thaw valve.
	Pressure relief valve open.	Replace converter with RFI converter.
Oxygen supply consumed too quickly.	Converter not completely filled during filling operation.	Refill converter.
	System leakage.	Locate and repair leaks.
	Combination valve partially open, venting gas.	Replace converter with RFI converter.
Filler line cannot be disconnected from filler valve.	Filler nozzle frozen to filler valve.	Thaw nozzle.
Low, or no system pressure.	System leakage.	Locate and repair leaks.
	Pressure closing valve out of adjustment.	Replace converter with RFI converter.
Quantity gage indicates empty.	System empty; defective probes or gage.	Refill converter; replace converter or gage.
LOX system contaminated.	Undesirable odors, or moisture.	Purge system.

7-33. Functional Test. To functionally test the converter assembly and aircraft oxygen system, proceed as follows:

NOTE

The Functional Test should also be performed whenever a component of the aircraft oxygen system is removed/replaced.

1. Ensure that all circuit breakers associated with the LOX quantity indicating system are set.

NOTE

External electrical power must be applied to the aircraft to perform steps 2 and 3.

Refer to applicable aircraft Handbook of Maintenance Instructions (HMI) to determine at what quantity (indicated on quantity gage) the low warning light should illuminate.

2. Depress oxygen test switch. Check quantity gage and low warning light for proper operation.

3. Release test switch. Ensure that gage pointer returns to position registered on gage before depressing. When test is completed, disconnect electrical power from aircraft.

4. Ensure that oxygen shut-off valve is in OFF position.

5. Attach an oxygen mask, regulator, and regulator-to-seat kit hose assembly to oxygen supply connection in aircraft.

6. Turn oxygen shut-off valve to ON position. There should be a flow of oxygen through the mask.

NOTE

Resistance during exhalation is due to the positive pressure feature of the regulator.

7. Place mask against face and breathe. There should be a slight resistance during exhalation.

8. Upon completion of functional test, turn oxygen shut-off valve to OFF. Disconnect regulator-to-seat kit hose from aircraft supply connection.

7-34. If discrepancies are found or suspected, Maintenance Control shall be notified.

7-35. Components of the aircraft oxygen system which do not pass inspection and cannot be repaired in the aircraft shall be removed and replaced by Ready For Issue (RFI) components. Forward defective components to AIMD for Bench Test.

7-36. CALENDAR INSPECTION. The Calendar Inspection shall be performed on all liquid oxygen converters that incorporate a quick-disconnect mounting plate prior to placing in service and at intervals not exceeding 231 days thereafter. This interval applies to all converters: aircraft-installed, shop spares, and those maintained in a servicing pool.

7-37. The Calendar Inspection consists of a Visual Inspection followed by a Bench Test. All work shall be performed in a clean, dust-free and oil-free area. Converter assemblies found to be damaged or out of adjustment shall be repaired by replacing or adjusting the discrepant part or parts. After repair, repeat the Bench Test.

NOTE

Liquid oxygen converters new from supply, manufacture, or from NARF overhaul do not require the bench test decal. The bench test decal shall be placed on the converter by the local AIMD when the converter is placed in service and after each Bench Test.

7-38. Visual Inspection. Inspect the converter assembly in accordance with table 7-3.

7-39. Liquid oxygen converters failing the Visual Inspection or Bench Test (paragraph 7-44) shall be repaired, if specific repair is authorized. SM&R codes, define repairable components and levels of maintenance authorized to perform repairs. Further explanation is found in Naval Aviation Maintenance Program Manual, OPNAVINST 4790.2 Series.

Table 7-3. Visual Inspection of Type GCU-24/A Liquid Oxygen Converter, P/N 21170-10/-13

Part Nomenclature	Index Number	Inspect For	Remedy
Note: Index numbers in this table refer to figure 7-14.			
Identification and performance plates.	-68 and -70	Legibility, condition and security.	Secure in place, or replace.
Warning and bench test decals.	-73 and -74	Presence and condition.	Replace or apply as required.
Handle.	-26	Bends and cracks.	Replace.
Tubing assemblies.	-1, -5, -6, -7, -11, -12, and -16	Cracks, dents, nicks, scratches, twists, and proper clearance. Damaged connectors and tube nuts.	Replace damaged tubing assemblies and connectors. Tubing may be slightly bent to maintain a minimum 1/7-inch clearance between other converter components.
Elbows and nipples.	All.	Cracks, dents and scratches.	Replace.
Quick-disconnect and vent port couplings.	-36 and -56	Visible damage.	Replace.
Fill, buildup, and vent valve.	-44	Cracks, damaged poppet valve, noise piece, or worn helical grooves.	Replace.
Clamps.	All.	Security and condition.	Tighten or replace.
Pressure Control valve.	-64	Cracks or other visible damage. Presence and condition of safety wire and Glyptal dot.	Replace.
Relief valve assembly.	-55	Visible damage. Presence and condition of safety wire and Glyptal dot.	Perform Bench Test.
Converter, mounting base and tie down assembly.	-65 and -72	Cracks, broken welds, or other visible damage.	Replace damaged components.
Container assembly.	-67	Evidence of overpressurization (dime like protrusion) excessive dents, chipped paint or other damage.	Refer to paragraph 7-61 for size of acceptable dents. Restore finish by painting (paragraph 7-61).
Converter assembly.	No Index.	Freedom from dirt, hydrocarbons and corrosion.	Clean (paragraph 7-56) and/or refinish (paragraph 7-61).

7-40. BENCH TEST.

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical over-pressurization, immediately comply with the emergency pressure relief procedures given in paragraph 7-28 at the beginning of this section.

When working with oxygen, make certain that clothing, tubing fittings, and equipment are free of oil, grease, fuel, hydraulic fluid, or any combustible material. Fire or explosion can result when even slight traces of combustible material come in contact with oxygen under pressure.

Prior to use, inspect leak detection compound. Compound which is not clear and free from suspended material/sediment is considered contaminated and shall be disposed of. Compound exhibiting peculiar odors such as acetone or alcohol is considered contaminated and shall be disposed of.

When using leak detection compound carefully avoid getting it on Probe Wire connections as moisture will cause incorrect capacitance/insulation reading.

NOTE

Some in-service liquid oxygen converter test stands that bear numbers other than those mentioned in paragraph 7-45 or covered in appropriate ground support equipment manual still exist. Use of these test stands is authorized provided they are capable of monitoring converter performance as specified in the bench test.

7-41. The Bench Test shall be performed using Liquid Oxygen Converter Test Stand P/Ns 59A120, 31TB19951, 1455AS100-1, or 31TB1995-4. Refer to appropriate ground support equipment manual for identification of test stand controls and indicators referenced in Bench Test procedures. Do not attempt to perform any Bench Test without first becoming thoroughly familiar with the test stand (refer to appropriate ground support equipment manual). Utilize Performance Test Sheet (figure 7-4) when performing Bench Test.

NOTE

Tests are arranged so they proceed from one test to the next with a minimum of flow changes. Troubleshooting tables are provided following each test.

7-42. TARE WEIGHT. To find the Tare Weight of the complete converter assembly, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

NOTE

Tare Weight is the weight of the complete converter assembly less the weight of the LOX.

1. Ensure all LOX has been removed from the converter.

2. Place converter assembly on scale of at least 50-lb capacity. Record weight in space provided on Performance Test Sheet.

7-43. CONVERTER ASSEMBLY PURGE. To purge the converter assembly proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Bag, Plastic	MIL-B-117 (CAGE 81349)
As Required	Nitrogen, Oil-free, Water Pumped, Type I, Class I, Grade B	Fed Spec BB-N-411 NIIN 00-985-7275

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
2 ea	Cap Assembly	AN929-5
1	Coupling, Quick-disconnect, Half	256000-1 MS22068-8 (CAGE 83533)
1	Expander, Thread, Screw, Bushing	AN894-8-4
1	Purging Unit, Gas/LOX, Model A/M26M-3	3447AS100-1

WARNING

Use only oil-free nitrogen for purging LOX converters.

Purging unit model A/M26M-3 has two specially designed 3500 psig nitrogen cylinders. Do not substitute these cylinders with other nitrogen cylinders such as NAN cart cylinders.

While operating purging unit model A/M26M-3, protective gloves must be worn by operator. Discharge fittings and hoses can reach temperatures that will cause burns if grasped with bare hands.

NOTE

Personnel operating purging unit model A/M26M-3 should be thoroughly familiar with all valves and controls prior to operating. Refer to appropriate support equipment manual. Personnel operating purging unit model A/M26M-3 shall be licensed in accordance with OPNAVINST 4790.2 series.

Liquid oxygen converters shall be emptied of all LOX and allowed to warm to ambient temperature prior to purging.

Index numbers in parentheses for LOX converter assembly, refer to figure 7-14.

NOTE

Index numbers for purging unit model A/M26M-3 refer to figure 7-9.

1. Remove two supply lines (14) from purge unit cabinet. Connect one end of each supply line (14) to nitrogen supply cylinders and the other ends to the supply inlet connections (22) of purge unit.

2. Remove insulated hose (15) from purge unit cabinet. Connect quick-disconnect (18) of insulated hose (15) to system (A) quick disconnect (19) of purge unit.

3. Screw boss to pipe fitting onto quick-disconnect coupling and attach to B-nut (23) of insulated hose (15).

4. Turn purge unit 3-way valve (20) to system (A) position.

5. Ensure power switch (5) is OFF.

6. Remove power cable (17) from purge unit cabinet and plug into 110 volt outlet.

7. Open both nitrogen supply cylinder valves.

8. Open hand shutoff valves (1) and (3). High pressure gage (4) will indicate nitrogen supply cylinder pressure.

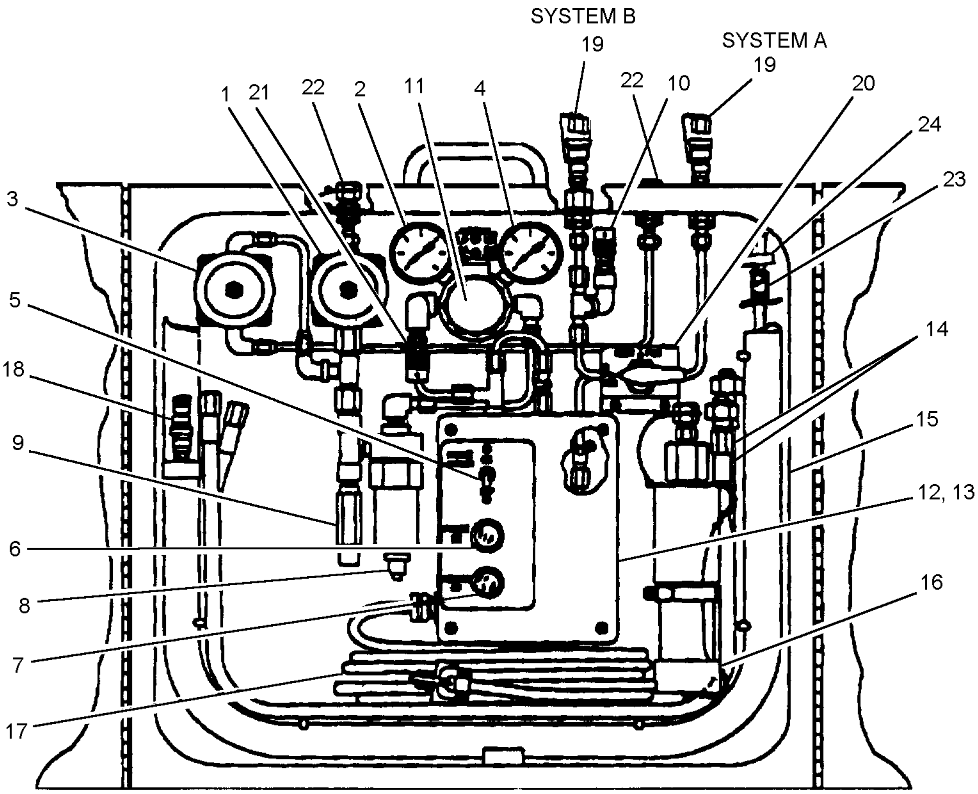
9. Remove screw (3) and washer (4) from LOX converter.

10. Remove tube assembly (1) by loosening two nuts and place tube assembly (1), screw (3), and washer (4) in a plastic bag.

11. Cap fittings on fill, build up, and vent valve and relief valve that tube assembly (1) was removed from using two caps assemblies.

12. Connect quick-disconnect coupling attached to insulated hose (15) to LOX converter vent port of fill, build up, and vent valve (43).

13. Attach adapter to fill port of LOX converter fill, build up, and vent valve (43). Turn knurl knob of adapter clockwise until it seats, then back off counterclockwise two complete full turns. This will place the fill, build up, and vent valve half way between the fill/vent and build up/vent modes.



Description	Function
1. Hand Shutoff Valve	Controls Supply Gas Flow
2. Low Pressure Gage	Indicates Delivery Gas Pressure (0-200 PSIG)
3. Hand Shutoff Valve	Controls Supply Gas Flow
4. High Pressure Gage	Indicates Supply Gas Pressure (0-4000 PSIG)
5. Power Switch	Master On/Off Switch/Circuit Breaker
6. Power On Light	Indicates Master Switch is On and Set is Operational
7. Heater On Light	Indicates Operation of Heater
8. Priority Valve	Stops Gas Flow When Supply Gas Pressure Falls Below 200 PSIG
9. Relief Valve	Relieves Supply Pressure Exceeding 3750 PSIG
10. Low Pressure Relief Valve	Relieves Service Line Supply Pressure Exceeding 705 PSIG
11. Pressure Regulator Assembly	Regulates Pressure to 0-200 PSIG
12. Temperature Control Switch (Under Plate)	Cycles Off and On to Control Exit Gas
13. High Temperature Shutdown (Under Plate)	Shuts Off Heater when Heater Block Temperature Reaches 285°F
14. Supply Line	Connects Supply Cylinders to Housing Assembly
15. Insulated Hose Assembly	Connects Housing Assembly
16. Filler Valve	Connects Insulated Hose Assembly to Converter
17. Power Cable	Connects Unit to Electrical Power
18. Quick Disconnect	Connects Insulated Hose to 19 System A or B
19. Quick Disconnect	Connection for Insulated Hose to 19 System A or B
20. 3-Way Valve	Selects A or B Outlet Ports
21. High Pressure Relief Valve	Relieves Service Line Supply Pressure Exceeding 1355 PSIG
22. Supply Pressure Inlet	Connects Supply Line 14 to Purge Unit
23. B-Nut	Connects Insulated Hose to Filler Valve 16 or Adapter (Not Shown)
24. Adapter	Connects Insulated Hose to P-3 Aircraft Filler Port

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Figure 7-9. A/M26M-3 Purging Unit

14. Attach LOX converter drain lines (figure 7-8) to LOX converter supply quick-disconnect coupling (16).

15. Turn power switch (5) to ON position. Power on light (6) should illuminate.

16. Turn pressure regulator (11) clockwise until 120 psig is indicated on low pressure gage (2).

NOTE

For LOX converters that show indications of internal probe short, it may be necessary to purge the converter for a longer period of time when performing step 17.

17. Observe heater on light (7), when light cycles from on to off, purge the converter for 60 minutes, with a minimum discharge temperature of 90°F.

18. When purging is completed, turn purging unit power switch (5) to off.

19. Close nitrogen supply cylinder valves.

20. Observe low pressure gage (2) and high pressure gage (4) until they indicate 0 psig. Back out counterclockwise on pressure regulator (11).

21. Close hand shutoff valves (1) and (3).

22. Disconnect insulated hose (15) from LOX converter vent port fitting of fill, build up, and vent valve (43) and purging unit system (A) quick-disconnect (19).

23. Remove drain lines (figure 7-8) from LOX converter supply quick-disconnect coupling (16).

24. Remove adapter from filler port of fill, build up, and vent valve (43).

25. Using dry oil-free nitrogen, blow dry tube assembly (1) removed in step 10.

26. Uncap fittings that were capped in step 11.

27. Attach tube assembly (1) to fill, build up, and vent valve and relief valve.

28. Attach clamp (2) to converter using screw (3) and washer (4).

29. Stow all lines and accessories and secure from purging.

7-44. INSULATION RESISTANCE TEST (EMPTY). To perform the Insulation Resistance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Prior to proceeding, it should be noted that the minimum acceptable megohm readings have been changed as follows: between A to B, 2.0 megohms; between A to ground and B to ground, the reading shall not be less than 1.0 megohm. These readings are acceptable as long as the converter passes the Capacitance Test (Empty) and Capacitance Test (Full).

1. Secure empty converter in rack provided on test stand counter top.

2. Using test stand cable assembly (figure 7-10), connect converter probe assembly electrical connectors (23 and 24) to terminals marked A and B of liquid oxygen quantity gage capacitance type tester.

3. Turn power switch ON and allow tester to warm up 10 minutes prior to proceeding.

4. Turn MEGOHMMETER RANGE SELECTOR to X-1 position.

5. Turn FUNCTION SELECTOR knob to A to B position. Record reading in space provided on Performance Test Sheet. Reading should not be less than 2.0 megohms.

6. Turn FUNCTION SELECTOR knob to A TO GROUND and B TO GROUND positions, respectively. Record readings in spaces provided on Performance Test Sheet. Readings shall not be less than 1.0 megohm in either position.

NOTE

If insulation resistance readings are within the minimum acceptable megohm requirements, proceed to Capacitance Test (Empty).

If insulation resistance readings are less than the minimum acceptable megohm requirements, moisture may still be present in container assembly; proceed to step 7.

7. Purge converter in accordance with paragraph 7-43, and repeat Insulation Resistance Test (Empty).

NOTE

Converter assemblies that fail the Insulation Resistance Test and cannot be corrected by purging shall be forwarded to the next higher maintenance repair facility.

8. Leave all connections unchanged.

7-45. CAPACITANCE TEST (EMPTY). To perform the Capacitance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Turn CAPACITANCE RANGE SELECTOR knob to X-10 position.

2. Turn FUNCTION SELECTOR knob to CAPACITANCE (UUF) position.

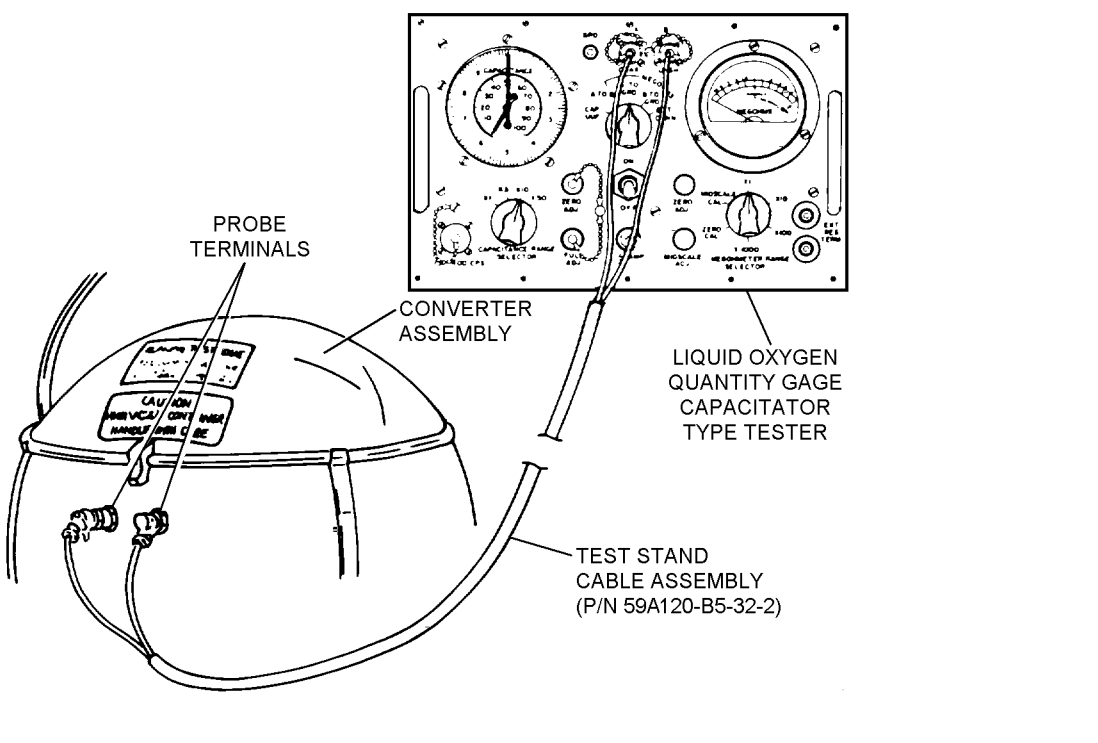


Figure 7-10. Capacitance/Insulation Resistance Test Hook-Up Probe Terminals

3. Record reading in space provided on Performance Test Sheet. Reading shall be 121.5 to 125.5 micromicrofarads (μμF).

NOTE

If reading is acceptable, proceed to step 5.

If reading is not within 121.5 to 125.5 micromicrofarads, moisture may still be present within the container assembly; proceed to step 4.

4. Purge converter in accordance with paragraph 7-43, and repeat Capacitance Test (Empty).

NOTE

Converter assemblies that fail the Capacitance Test and cannot be corrected by purging shall be forwarded to the next higher maintenance repair facility.

5. Secure power to tester and disconnect test stand cable assembly from converter and test stand.

7-46. RELIEF VALVE TEST. To perform the Relief Valve Test, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Glyptal	1201B (CAGE 24452)
As Required	Lockwire	MS20995C20

Support Equipment Required

Quantity	Description	Reference Number
1	Hose Assembly, Stand, Test	59A120-B5-14
1	Hose Assembly, Stand, Test	59A120-B5-52
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Index numbers in parentheses refer to figure 7-14.

1. Remove pressure control valve to supply manifold tube (16).

2. Using test stand hose assembly, connect BELL JAR BOTTOM COUPLING (C-1) to nipple (54) where tube (16) was connected.

3. Using test stand hose assembly, connect converter vent port coupling (36) to test stand FLOWMETER connection (NIP-4).

4. Ensure TEST PRESSURE GAGE-TO-BELL JAR valve (V-2) is open. Turn FLOWMETER SELECTOR valve (V-1) to the 0-150 lpm position.

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly and observe TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2) when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

5. Slowly open OXYGEN SUPPLY valve (V-6) until 100 lpm flow is indicated on (PG-2).

6. With 100 lpm flow indicated on FLOWMETER INDICATOR gage (PG-2) reading on TEST PRESSURE gage (PG-1) shall be 100-120 PSIG. Record readings from TEST PRESSURE gage (PG-1) and PG-2 on Performance Test Sheet.

7. Using OXYGEN SUPPLY valve (V-6) and SYSTEM BLEED valve (V-5) reduce pressure applied to converter to 95 psig as indicated on TEST PRESSURE gage (PG-1).

8. Disconnect test stand hose from FLOWMETER connection (NIP-4).

CAUTION

When attaching test stand hose to FLOWMETER connection (NIP-1), attach slowly while observing FLOWMETER INDICATOR gage (PG-2), excessive relief valve leakage could damage FLOWMETER INDICATOR gage (PG-2).

9. Turn FLOWMETER SELECTOR valve (V-1) to the 0.0-0.25 lpm position and slowly connect test stand hose to FLOWMETER connection (NIP-1).

10. While maintaining 95 psig to the converter with OXYGEN SUPPLY valve (V-6) check for leakage indicated on FLOWMETER INDICATOR gage (PG-2). Maximum allowable leakage is 0.01 lpm. Record reading on Performance Test Sheet.

NOTE

If leakage is excessive or if relief valve fails to vent at required flow and pressure, locate probable cause using troubleshooting chart, table 7-4.

11. Apply Glyptal dots to safety-wired setscrews.

12. Close OXYGEN SUPPLY valve (V-6). Bleed test stand using SYSTEM BLEED valve (V-5). Close TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

13. Disconnect test stand hose assemblies from converter and from test stand.

14. Replace pressure control valve to supply manifold tube (16).

7-47. CONVERTER LEAKAGE TEST. To perform the Converter Leakage Test, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Coupling, Quick-disconnect (Female)	199000-1 MS22068-7
1	Hose Assembly, Stand, Test	59A120-B5-14
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Index numbers in parentheses refer to figure 7-14.

1. Connect quick-disconnect coupling to test stand hose assembly.

2. Using hose assembly, connect test stand BELL JAR BOTTOM COUPLING (C-1) to converter supply quick-disconnect coupling (56).

3. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

4. Utilizing OXYGEN SUPPLY valve (V-6), apply 95 psig as indicated on TEST PRESSURE gage (PG-1) to converter.

5. Maintain 95 psig and inspect for leakage at all connections using leak detection compound. There is no allowable leakage. If leakage is indicated, locate probable cause using troubleshooting chart, table 7-5.

6. Close OXYGEN SUPPLY valve (V-6). Bleed test stand using SYSTEM BLEED valve (V-5). Close TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

7. Disconnect hose assembly installed in step 2 from converter quick-disconnect coupling (56) and apply leak detection compound to converter supply quick-disconnect coupling (56).

8. Using adapter, bleed pressure from the converter.

9. Remove converter assembly from test stand.

Table 7-4. Troubleshooting (Relief Valve Test)

Trouble	Probable Cause	Remedy
Relieving below 100 psig.	Relief valve out of adjustment.	Adjust relief valve (paragraph 7-65, 66, and 67).
Relieving above 120 psig.	Relief valve out of adjustment.	Adjust relief valve (paragraph 7-65, 66, and 67).
Relief valve fails to vent 100 lpm.	Relief valve out of adjustment.	Adjust relief valve (paragraph 7-65, 66, and 67).
Leakage in excess of 0.01 lpm.	Relief valve out of adjustment.	Adjust relief valve (paragraph 7-65, 66, and 67).
Relief valve cannot be adjusted to tolerances.	Defective parts.	Replace relief valve.

7-48. FILL AND BUILDUP TIME TEST. To perform the fill and buildup time test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Fixture, Test, Valve, Gage/ Relief, Pressure	Fabricate IAW figure 7-6
1	Line, Drain, Port, Vent	Fabricate IAW figure 7-7

WARNING

Because of the extreme low temperature of LOX, use extreme care at all times when handling LOX. Ensure prescribed protective clothing is worn and all safety precautions are observed (Chapter 3).

Ensure venting LOX is directed away from all personnel in the area.

NOTE

Personnel servicing LOX converters and operating LOX transfer equipment shall be qualified and licensed in accordance with OPNAVINST 4790.2 Series.

To perform this test, it will be necessary to take the converter to a LOX servicing area or use a LOX servicing trailer in the immediate area of the Oxygen Shop. Any other method is acceptable that meets requirements of the test and does not violate safety precautions outlined in Chapter 3.

1. Connect the converter to the servicing trailer.

NOTE

If servicing trailer being used is not the closed loop type, attach a vent port drain line (figure 7-7) to the vent port coupling (36). Ensure vent port drain line is attached to route venting LOX away from all personnel.

2. Note the time, and fill the converter following applicable instructions for specific ground support equipment servicing trailer being used.

3. When the converter is full, note the time. Time required to fill the converter shall not exceed 10 minutes. Record fill time in space provided on Performance Test Sheet.

Table 7-5. Troubleshooting (Converter Leakage Test)

Trouble	Probable Cause	Remedy
Any fitting connection leaking.	Loose connection.	Tighten connection.
Elbow or nipple fitting leaking.	Stripped threads, excessive burrs, deep scratches, inside or outside diameter out of round or loose.	Tighten or replace fitting(s).
Tubing leaking.	Dents, kinks, deep scratches, twisted tubing, improperly flared ends, or damaged connectors.	Replace tubing.

4. Note the time, and disconnect and secure the servicing trailer and remove vent port drain line if installed. Time noted is beginning of Buildup Time Test.

NOTE

The test pressure gage relief valve test fixture shall be forwarded to the Intermediate Maintenance activity every 6 months for pressure gage calibration and relief valve adjustment and leakage test.

5. Immediately after servicing, attach pressure gage/relief valve test fixture (figure 7-6) to converter supply quick-disconnect coupling (16) and observe for 5 minutes; the following actions should occur:

a. The converter should begin to build head pressure as indicated on the pressure gage/relief valve test fixture. Initially the converter will build a pressure that will cause the LOX converter relief valve to relieve (110 to 120 psig). This action may occur twice.

WARNING

When performing step 5b, if pressure fails to stabilize, drain the LOX converter and forward to Intermediate Level maintenance.

b. After step 5a occurs, pressure indication on the pressure gage/relief valve test fixture should stabilize at LOX converter pressure closing valve setting of 55 to 90 psig (a slight fluctuation of 2 to 3 psig on the pressure gage/relief valve test fixture will be present).

6. Disconnect pressure gage/relief valve test fixture from supply quick-disconnect coupling.

7. If converter fails to build head pressure, converter relief valve fails to relieve between 110 to 120 psig, or converter fails to stabilize between 55 to 90 psig, refer to troubleshooting chart, table 7-6.

7-49. CAPACITANCE TEST (FULL). To perform the Capacitance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-180D or equivalent

NOTE

This test requires simultaneous use of the 50-lb capacity scale and the quantity gage capacitance type tester incorporated in the test stand. Ensure that scale is positioned close enough to tester.

1. Place full converter on a scale of at least 50-lb capacity.

2. Using test stand cable assembly (figure 7-10), connect converter probe assembly electrical connectors (23 and 24) to terminals marked A and B of liquid oxygen quantity gage capacitance type tester.

3. Turn power ON and allow tester to warm up 10 minutes before proceeding.

4. Turn CAPACITANCE RANGE SELECTOR knob to 10X position.

5. Turn FUNCTION SELECTOR knob to CAPACITANCE (UUF) position.

6. Enter total weight of full converter in space provided on Performance Test Sheet.

7. Enter tare weight of converter in space provided on Performance Test Sheet.

NOTE

If the weight of the LOX in the converter is 24 lbs 4 oz, 24 lbs 8 oz, and etc.; the ounces must be converted to decimal.

Example

24 lb 4 oz = 24-4/16 lbs
24-4/16 lbs = 24.25 lbs

Enter 24.25 on the Performance Test Sheet.

8. Subtract tare weight of converter from total weight. Enter this figure on Performance Test Sheet. This is weight of LOX in converter.

9. Calculate the capacitance maximum (C-max) by multiplying the weight of the LOX (W) by 2.33 and adding 124.7 to the result (2.33(W) + 124.7 = C-max). Enter the result in the space provided on the Performance Test Sheet.

10. Calculate the capacitance minimum (C-min) by multiplying the weight of the LOX (W) by 2.25 and adding 122.3 to the result (2.25(W) + 122.3 = C-min). Enter the result in space provided on Performance Test Sheet.

11. Observe and record capacitance reading from test stand capacitance gage in space provided on Performance Test Sheet. Reading shall be between minimum and maximum established in steps 9 and 10.

NOTE

If capacitance reading is acceptable, proceed to step 14.

If capacitance reading is not within the calculated limits and the converter has not been purged in previous tests, moisture may be present within the container assembly; proceed to steps 12 and 13.

12. Purge converter in accordance with paragraph 7-43.

13. Fill converter with LOX and repeat Capacitance Test (Full).

NOTE

If capacitance reading is still not within the calculated limits, the converter shall be forwarded to the next higher maintenance repair facility.

14. Secure tester and disconnect cable (figure 7-10) from converter and tester. If converter passes Capacitance Test, carefully remove converter from scale.

7-50. FLOW TEST. To perform the Flow Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Hose Assembly, Stand, Test	59A120-B5-12
1	Hose Assembly, Stand, Test	59A120-B51
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Secure converter in rack provided on test stand counter top.

2. Using test stand hose assembly, interconnect test stand FLOWMETER connection (NIP-4) to CONVERTER SUPPLY OUTLET connection (NIP-5).

3. Using test stand hose assembly, connect test stand SUPPLY-TO-CONVERTER connection (NIP-6) to converter supply quick-disconnect coupling (56).

4. Place test stand FLOWMETER SELECTOR valve, (V-1) in 0-150 lpm position. Open TEST PRESSURE GAGE BUILD-UP AND FLOW valve (V-10).

NOTE

If TEST PRESSURE gage (PG-1) reads above 90 psig, attach fill vent adapter to the fill, buildup, and vent valve. Vent converter system pressure to 70 psig by turning knurled knob clockwise.

5. Open test stand CONVERTER SUPPLY FLOW CONTROL valve (V-9) to a flow of 120 lpm as indicated on FLOWMETER INDICATOR gage (PG-2). Flow for a minimum of 5 minutes.

6. While maintaining a 120 lpm flow, the converter shall maintain pressure of 55 to 90 psig as indicated on TEST PRESSURE gage (PG-1). Record pressure in space provided on Performance Test Sheet.

7. If converter supply pressure is not within limits, locate probable cause using troubleshooting chart, table 7-7.

8. Disconnect test stand hose assemblies attached in steps 2 and 3. Close all test stand valves.

Table 7-6. Troubleshooting (LOX Converter After Servicing)

Trouble	Probable Cause	Remedy
Converter fails to build head pressure.	Converter fill, buildup, and vent valve failed to return to build-up and supply mode.	Forward converter to AIMD for purge or valve replacement and Bench Test. Drain converter by removing tube assembly (index number 5, figure 7-14). Place converter upside down in drain pan and allow to drain by gravity flow process.
Converter relief valve fails to relieve between 110 to 120 psig.	Converter relief valve out of adjustment or defective.	Forward converters to AIMD for relief valve adjustment or replacement and Bench Test.
Converter pressure continues to build and will not stabilize.	Converter pressure closing valve defective.	Forward converter to AIMD for pressure closing valve replacement and Bench Test.

Table 7-7. Troubleshooting (Flow Test)

Trouble	Probable Cause	Remedy
Converter fails to maintain operating pressure.	Pressure control valve out of adjustment.	Adjust in accordance with paragraph 7-71, steps 30a thru 30d.
	Pressure control valve damaged.	Replace pressure control valve.

Table 7-8. Troubleshooting (Evaporation Loss Test, Buildup and Supply Mode)

Trouble	Probable Cause	Remedy
Excessive weight loss.	Loss of vacuum in container assembly.	BCM converter assembly.
Excessive weight loss (Evaporation Loss Test (Buildup and Supply Mode)).	Excessively leaking valves, tubing, and/or fittings.	Replace valves. Tighten or replace fittings. Repeat converter leakage test (paragraph 7-47).
	Pressure control valve out of adjustment of defective.	Adjust pressure control valve in accordance with (paragraph 7-71, step 30).
Frosting of container assembly.	Loss of vacuum in container.	BCM converter assembly.

9. Remove converter from test stand and allow to remain undisturbed for 1 hour.

7-51. EVAPORATION LOSS TEST (BUILDUP AND SUPPLY MODE). To perform the Evaporation Loss Test in the buildup and supply mode, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

1. Gently place converter on scale and record time and converter weight on Performance Test Sheet.

2. Place converter assembly aside and allow it to remain undisturbed for 24 hours.

3. Carefully place converter on scale and record time and weight in spaces provided on Performance Test Sheet. Weight loss in 24 hours shall not exceed 3.0 lbs.

4. If weight loss is 3.0 lbs or less, and there is no excessive frosting of the sphere assembly, proceed to step 5 and drain the converter. If weight loss is in excess of 3.0 lbs or if there is sphere assembly frosting, consult troubleshooting chart, table 7-8, then proceed to paragraph 7-52.

WARNING

Ensure that all personnel safety precautions are observed during converter drain.

5. Drain converter until completely empty of LOX.

7-52. EVAPORATION LOSS TEST (VENTED MODE). To perform the Evaporation Loss Test in the vented mode, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

NOTE

This test required only if converter fails Evaporation Loss Test in buildup and supply mode. By comparing the weight loss of this test to that recorded during the buildup and supply Evaporation Loss Test, it is possible to determine whether sphere assembly degradation, vacuum loss, fitting leakage, or valve malfunction was responsible for converter failure during the buildup and supply Evaporation Loss Test.

1. With converter still on scale, attach test stand fill valve adapter to the fill, buildup, and vent valve on converter.

WARNING

Venting a converter that is in a buildup and supply mode causes a blast of LOX from vent port (figure 7-14, item 36). Ensure that vent blast is directed away from all personnel, and that adequate clothing and facial protection are worn.

2. Turn knurled knob of adapter clockwise until it seats. This will place the converter in the vented mode.

3. After converter stabilizes, record time and weight in spaces provided on Performance Test Sheet.

4. Place converter aside and allow it to remain undisturbed in the vented mode for 24 hours.

5. At the end of the 24-hour period, carefully place converter on scale.

6. Record time and weight in spaces provided on Performance Test Sheet. Weight loss in 24 hours shall not exceed 5.0 lbs.

NOTE

A converter that loses 5.0 lbs or less in the vented mode and the weight loss is more than in the buildup and supply mode (see example A) shall be considered an acceptable unit. If the weight loss is more than 5.0 lbs (see example B) or if the weight loss is less than it was in the buildup and supply mode (see example C) locate probable cause using troubleshooting chart table 7-9.

Example A:
Weight loss
buildup and supply mode = 3.5 lbs.
Weight loss vented mode = 4.0 lbs.
Converter is RFI.

Example B:
Weight loss
buildup and supply mode = 4.0 lbs.
Weight loss vented mode = 6.0 lbs.
Locate probable cause
using troubleshooting chart.

Example C:
Weight loss
buildup and supply mode = 4.0 lbs.
Weight loss vented mode = 3.0 lbs.
Locate probable cause
using troubleshooting chart.

7. Remove fill valve adapter installed in step 1, and proceed to step 8 and drain the converter.

WARNING

Ensure that all personnel safety precautions are observed during converter drain.

8. Drain converter until completely empty of LOX.

7-53. CONVERTER CHARGE. To charge the converter, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Coupling, Quick-disconnect (Female)	199000-1 MS22068-7
1	Hose Assembly, Stand, Test	59A120-B5-14
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

CAUTION

Upon completion of bench test, converter shall be charged with gaseous oxygen to 25 to 30 psig to prevent entry of moisture and other contaminants during shipment/storage.

NOTE

Liquid oxygen converters that fail bench test and are beyond capability of maintenance (BCM) do not require converter charge.

1. Secure converter in rack provided on test stand counter top.

2. Connect quick-disconnect coupling to test stand hose assembly.

3. Using hose assembly, connect test stand BELL JAR BOTTOM COUPLING (C-1) to converter quick-disconnect coupling (56).

4. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

5. Using OXYGEN SUPPLY valve (V-6), charge converter to 25 to 30 psig. Pressure will be indicated on TEST PRESSURE gage (PG-1).

6. Close OXYGEN SUPPLY valve (V-6), disconnect hose assembly connected in step 2, and bleed test stand using SYSTEM BLEED valve (V-5). Secure all test stand valves.

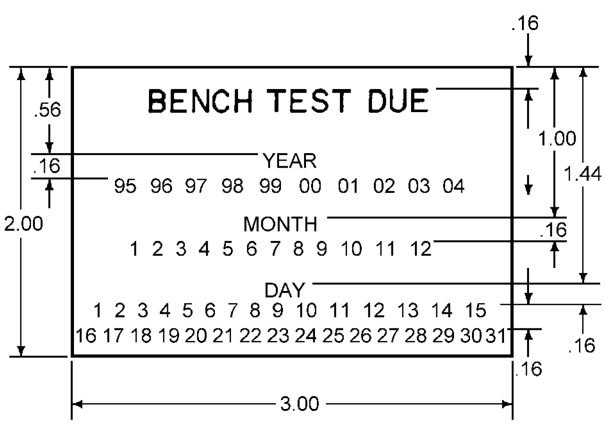
7. Test stand operator and CDI sign Performance Test Sheet. Retain Performance Test Sheet until next scheduled bench test is performed.

8. Mark due-date of next Bench Test on bench test decal (figure 7-11). Due date shall be 231 days from last Bench Test date. Affix decal to converter in a position in which it will be visible when converter is installed in aircraft.

9. Annotate station/ship performing Bench Test on a serviceable condition label and affix to bench test decal so as not to interfere with marked due date.

NOTE

Bench test decals may be procured from Customer Service at the nearest NARF.



NOTES:

1 MATERIAL SHALL BE ELASTOMERIC PRESSURE SENSITIVE TYPE ADHESIVE BACKED, IN ACCORDANCE WITH MIL-M-43719, TYPE I, CLASS 1.
2 ALL LETTERS AND NUMBERS SHALL APPROXIMATELY MATCH GREEN NO. 14187 OF FED. STD. NO. 595; BACKGROUND SHALL APPROXIMATELY MATCH WHITE NO. 17875 OF FED. STD. NO. 595.
3 BENCH TEST DUE SHALL BE 18-POINT GOTHIC (SANS SERIF) LETTERING. ALL OTHER NUMBERS AND LETTERS SHALL BE 10-POINT, GOTHIC (SANS SERIF).

007011

Figure 7-11. Bench Test Decal

10. Install dust covers or plugs in/on all open couplings prior to shipping or storing converter.

7-54. DISASSEMBLY.

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical over-pressurization, immediately comply with the emergency pressure relief procedures given in paragraph 7-28 at the beginning of this section.

7-55. Disassemble the liquid oxygen converter using index numbers assigned to figure 7-14, unless otherwise noted. Disassemble the converter only as far as necessary to correct any malfunction. Disassemble the converter as follows:

CAUTION

All disassembly, inspection, repair, and assembly must be done on benches having good lighting and in an area provided with air conditioning. Walls, floor, and ceiling should have a smooth finish and be painted with a non-chalking paint which can be kept clean and dust free. It is desirable to keep all parts for each individual LOX converter separated. Make careful note of the location, angle of fitting, and quantity of all parts. Plastic partitioned boxes should be used to keep the parts segregated and protected from dirt and moisture. Plastic bags are also useful for storing subassemblies and component parts after cleaning and inspection until ready for assembly.

NOTE

Discard all O-rings, gaskets, seals, and teflon sealing tape removed from oxygen connections during disassembly.

No special tools are required to disassemble, adjust, or assemble this converter.

1. Remove clamp (2), securing fill valve to manifold tube assembly (1) to the container, by removing screw (3) and washer (4).

Table 7-9. Troubleshooting (Evaporation Loss Test, Vented Mode)

Trouble	Probable Cause	Remedy
Excessive weight loss.	Loss of vacuum in container assembly.	BCM converter assembly.
Weight loss in vented mode is less than in the buildup and supply mode.	Excessively leaking valves, tubing, and/or fittings when unit failed buildup and supply mode evaporation loss test.	Replace valves, Tighten or replace fittings. Repeat converter leakage test (paragraph 7-47).
	Pressure control valve out of adjustment or defective when unit failed buildup and supply mode evaporation loss test.	Adjust pressure control valve in accordance with paragraph 7-71, step 30.
		Replace pressure control valve.
Excessive frosting of container assembly.	Loss of vacuum in container.	BCM converter assembly.

2. Remove fill valve to manifold tube assembly (1) by loosening tube nuts at each end.

3. Remove tube assembly (5) by loosening the tube nuts at each end.

4. Remove fill tube assembly (6) by loosening the tube nuts at each end.

5. Remove the two clamps (8), securing tube assemblies (7 and 11), by removing screw (9) and nut (10).

6. Remove pressure control valve to buildup port tube assembly (7) and pressure control valve to liquid port tube assembly (11) by loosening the tube nuts at both ends.

7. Remove the two clamps (13) securing tube assemblies (12 and 16) by removing screw (14) and nut (15).

8. Remove supply tube assembly (12) and pressure control valve to supply manifold tube assembly (16) by loosening the tube nuts at each end.

9. Remove dust caps (17 and 20) from container by removing screws (18 and 21) and nuts (19 and 22).

10. Remove electrical connectors (23 and 24) from the container assembly (67).

11. Remove handle keeper (25) from container to mounting base tie down assembly (65).

12. Remove carrying handle (26) by removing the two nuts (27).

13. Remove fill valve cover assembly (45) by removing screw (28) and nut (29).

14. Remove 90° elbow (50) and tee fitting (51) from container assembly (67).

15. Remove three nipples (54), relief valve (55), and the supply quick-disconnect coupling (56) from supply manifold (57).

16. Remove supply manifold (57) from mounting base (72) by removing four screws (52) and four nuts (53).

17. Remove valve strap (30) from mounting base by removing screws (31 and 32) and two nuts (34).

18. Remove fill, buildup, and vent valve and fittings assembly by removing two screws (33) and two nuts (35).

19. Remove vent port coupling (36), two nipples (37), plug (40), vent fitting (41), 45° elbow (39), 90° elbow (38), and pipe elbows (42 and 43) from combination fill, buildup, and vent valve (44).

20. Remove pressure control valve and fittings assembly from mounting base (72) by removing two screws (58) and two washers (59).

21. Remove nipple (60), 45° elbow (61), orifice assembly (62), and fitting (63) from pressure control valve (64).

CAUTION

Ensure that container assembly is not damaged in handling.

22. Separate container assembly (67) from mounting base (72) by removing four nuts (64) and tiedown assembly (65).

7-56. CLEANING.

7-57. To clean the disassembled converter, proceed as follows:

Materials Required

Quantity	Description	Reference Number
1	Wash Bottle	MS36070A
As Required	Bag, Plastic	MIL-B-117
As Required	Nitrogen, Oil-free, Water Pumped, Type I, Class I, Grade B	Fed Spec BB-N-411 NIIN 00-985-7275

WARNING

Do not use oil, or any material containing oil, in conjunction with oxygen equipment. Oil, even in a minute quantity, coming in contact with oxygen can cause explosion or fire. Dust, lint, or fine metal particles are also dangerous.

1. Clean all metallic parts using procedures outlined in NAVAIR 13-1-6.4-1. Blow dry with oil-free nitrogen.

2. Prior to installation, wash all silicone rubber parts in distilled water and blow dry with oil-free nitrogen.

3. After cleaning, surfaces shall be examined for cleanliness. Should further contamination be found, reclean the parts in accordance with step 1.

4. Cleaned parts shall be sealed in plastic bags for storage. Bag all complete assemblies that are not immediately returned to service.

7-58. INSPECTION OF DISASSEMBLED PARTS.

7-59. Inspect the disassembled converter and component parts in accordance with table 7-10 and the following special instructions:

NOTE

Index numbers refer to figure 7-14.

1. Inspect all hardware items (nipples, elbows, etc.) for stripped threads, burrs, nicks, distortion, rust, corrosion, or other defects.

NOTE

Because of the method of suspension of shock-mounting of the inner container, some looseness can be detected in most containers by shaking the converter vigorously. Some models employ a spring type suspension that eventually loses some tension. Others have a nylon type spacer that experiences slight shrinkage. Looseness and rattles become more apparent with age. Some looseness can be detected in many new containers. Looseness or rattles is not a criterion for determining serviceability. The integrity of the container is determined by the 24-hour Evaporation Loss Test.

7-60. REPAIR.

7-61. Repair of the converter assembly is limited to replacing defective components, minor repairs (small dents, scratches, abrasions, nicks, etc) of tubing and container assembly, attachment of pinch-off tube protective cover, and touching-up painted surfaces. To make minor repairs, proceed as follows:

Table 7-10. Inspection of Disassembled Parts

Part Nomenclature	Index Number	Inspect For	Remedy
Note: Index numbers in this table refer to figure 7-14.			
Identification and performance plates.	-68 and -70	Security, condition and legibility.	Secure in place or replace if damaged or illegible.
Warning and bench test decals.	-73 and -74	Presence and condition.	Apply or replace as required.
Handle.	-26	Bends and cracks.	Replace.
Tubing assemblies.	-1, -5, -6, -7, -11, -12, and -16	Cracks, dents, nicks, scratches, twists or damaged connectors and tube nuts.	Replace.
Elbows and nipples.	All.	Cracks, dents, scratches and damaged threads.	Replace.
Quick-disconnect and vent port couplings.	-36 and -56	Visible damage.	Replace.
Supply manifold.	-57	Visible damage.	Replace.
Fill, buildup, and vent valve.	-44	Cracks, damaged poppet valve, nosepiece, or worn helical grooves.	Replace.
Clamps.	All.	Security and condition.	Tighten or replace.
Pressure relief and pressure control valves.	-55 and -64	Cracks or visible damage. Presence and condition of Glyptal dots. Presence and condition of safety wire.	Perform bench test.
Converter mounting base and tie down assembly.	-65 and -72	Cracks, broken welds, chipped paint, or other damage.	Replace damaged parts. Restore finish by painting (paragraph 7-61).
Container assembly.	-67	Excessive dents, chipped paint, or other damage.	Refer to paragraph 7-61 for size of acceptable dents. Restore finish by painting (paragraph 7-61).
Dust caps.	-17 and -20	Broken chain or damaged caps.	Replace.

Materials Required

Quantity	Description	Reference Number
As Required	Paint, Green, (Color 14187)	(Note 1)
As Required	Lacquer-Cellulose Nitrate, Gloss Color 622, Jet Black	NIIN 00-738-64
As Required	Adhesive	NIIN 00-738-6429
As Required	Glyptal	1201B (CAGE 24452)

Notes: 1. Use any available green paint, chip color 14187, approved by local Environmental Protection Agency.

1. Tubing assemblies with minor dents not causing flow restriction are considered serviceable. Small scratches, abrasions, and nicks can be smoothed with a burnishing tool or aluminum wool.

2. To avoid burnishing the same area more than once, each burnished area shall be identified by a painted band. Color and size of bands are as follows:

a. Color bands shall cover an area not less than 2 inches, nor more than 3 inches in length.

b. Green paint shall be used on black and aluminum tubing.

c. Black lacquer shall be used on green tubing.

d. If tubing is repainted, reidentify burnished area.

3. Tubing nicked, abraded, or scratched in an area previously identified as burnished shall be condemned.

4. Container assemblies having minor dents are considered serviceable, provided the converter passes the vented evaporation loss test. Normally, dents up to 3/8-inch deep will not affect function of the converter.

WARNING

When painting converter, ensure that fittings, tubing, and valves are removed or masked prior to painting. Paint and other foreign matter associated with painting introduced into these components could create an explosion hazard when contacting oxygen.

5. Container assemblies passing the vented evaporation loss test and having dents shall be identified by painting a 3/4-inch diameter dot over each dent using black lacquer.

NOTE

Converters that have actually been critically overpressurized will not pass the Bench Test. The integrity of the annular space has been lost during the critical overpressurization stage. These converters will frost at the dime-like protrusion area and the converter will not pass the Evaporation Loss Test.

Prior to replacing pinch-off tube protective cover, an evaporation loss test (vented condition) shall be performed in accordance with paragraph 7-52. This will ensure that the pinch-off tube was not damaged by whatever force loosened the protective cover.

6. Converters that have partial dime-like impressions, which were caused by rough handling or improper packaging, will normally pass the Bench Test and can be certified RFI. The partial dime-like impressions in this case shall be treated as a dent and painted black and the converter returned to service. If the converter happens to overpressurize in the future, there will be a frosting on top of the sphere in the area of the painted dot and a dime-like protrusion will begin to form.

7. Pinch-off tube protective covers may be secured back in place over the pinch-off tube as follows:

a. Clean area surrounding pinch-off tube and flange area of protective cover by sanding followed by cleaning area using procedures outlined in NAVAIR 13-1-6.4-1.

b. Mix equal portions of part “A” resin and part “B” activator. Mix thoroughly following instructions provided with adhesive.

c. Apply adhesive to flange of protective cover. Place cover over pinch-off tube, pressing in place to achieve a good bond. Wipe off excess adhesive and allow cover to remain undisturbed for approximately 8 hours.

7-62. ASSEMBLY.

7-63. Assembly of the liquid oxygen converter assembly is essentially the reverse of disassembly. Tests and adjustments are required on certain subassemblies as they are assembled to the converter.

WARNING

Prior to use, inspect leak detection compound. Compound which is not clear and free from suspended material/sediment is considered contaminated and shall be disposed of. Compound exhibiting peculiar odors such as acetone or alcohol is considered contaminated and shall be disposed of.

CAUTION

Use anti-seize tape (MIL-T-27730) on all male pipe thread fittings. Apply single layer of tape, overlapping ends just enough to avoid gap in tape when fitting is installed. To prevent tube blockage, ensure tape is clear of last thread.

Do not use anti-seize tape on flared or straight thread fittings.

7-64. RELIEF VALVE TEST. To test the relief valve on test stand (P/N 59A120) or similar prior to its installation, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compund, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-B5-8
1	Hose Assembly, Stand, Test	59A120-B5-12
1	Hose Assembly, Stand, Test	59A120-B5-52
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Ensure test stand is in secured position.

2. Attach test stand adapter to relief valve.

3. Connect relief valve to test stand BELL JAR BOTTOM COUPLING (C-1).

4. Open test pressure GAGE-TO-BELL JAR valve (V-2).

5. Close SYSTEM BLEED valve (V-5) and DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8) and open supply cylinder.

6. Open OXYGEN SUPPLY valve (V-6) and apply 95 psig to valve assembly as indicated on TEST PRESSURE gage (PG-1). Check for leakage around test relief valve and connector with leak detection compound. Correct any test stand leakage prior to proceeding.

7. Install test stand BELL JAR over relief valve and secure in place.

8. Using hose assembly (P/N 59A120-B5-12) connect BELL JAR TOP COUPLING (C-2) to FLOWMETER connection (NIP-4).

9. Turn FLOWMETER SELECTOR valve (V-1) to 0-150 lpm position.

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly and observe TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2) when applying pressure to the relief valve. Damage to the test stand gages could result from rapid surges in pressure.

10. Slowly open OXYGEN SUPPLY valve (V-6) until 100 lpm flow is indicated on FLOWMETER INDICATOR gage (PG-2).

11. With 100 lpm flow indicated on FLOW METER INDICATOR gage (PG-2) reading on TEST PRESSURE gage (PG-1) shall be 100 to 120 psig.

NOTE

If reading is not within acceptable limits proceed to paragraphs 7-65, 7-66, or 7-67 for adjustment procedures.

12. Using OXYGEN SUPPLY valve (V-6) and SYSTEM BLEED valve (V-5) reduce pressure applied to relief valve to 95 psig as indicated on TEST PRESSURE gage (PG-1).

13. Disconnect test stand hose (P/N 59A120-B5-52) from FLOWMETER connection (NIP-4).

CAUTION

When attaching test stand hose (P/N 59A120-B5-52) to FLOWMETER connection (NIP-1), attach slowly while observing FLOWMETER INDICATOR gage (PG-2), excessive relief valve leakage could damage FLOWMETER INDICATOR gage (PG-2).

14. Turn FLOWMETER SELECTOR valve (V-1) to the 0.0-0.25 lpm position and slowly connect test stand hose (P/N 59A120-B5-52) to FLOWMETER connection (NIP-1).

15. Maximum allowable leakage as indicated on FLOWMETER INDICATOR gage (PG-2) shall be 0.01 lpm.

16. Relieve pressure using SYSTEM BLEED valve (V-5).

17. Disconnect hose assembly.

18. Remove bell jar.

19. If relief valve vents properly, remove the assembly from test stand and disconnect test stand adapter from relief valve, safety wire and apply Glyptal dot in accordance with figure 7-12. Secure the test stand.

20. If relief valve fails to vent properly, or shows excessive leakage, adjust in accordance with corresponding relief valve Adjustment Procedures:

7-65. ADJUSTMENT PROCEDURES (ARO RELIEF VALVE, P/N 21247-1). Adjustment of the ARO Relief Valve (P/N 21247-1) involves 2 potential adjustments (figure 7-12). The valve can normally be brought into tolerance with the pressure adjustment screw, however, adjustment of the spring retainer may be required.

Materials Required

Quantity	Description	Reference Number
As Required	Glyptal	1201B (CAGE 24452)
As Required	Lockwire	MS20995C20

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-B5-8
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Remove lockwire from locknuts, remove Glyptal dot by applying a small amount of acetone.

NOTE

It may be necessary to adjust the minimum (100 psig) relieving pressure to comply with the maximum allowable leakage (0.01 lpm). This is acceptable, provided the valve relieves 100 lpm at 100 to 120 psig.

2. Loosen locknut (A).

3. If valve relieves below 100 psig, turn adjusting screw counterclockwise. If relieving above 120 psig, turn adjusting screw clockwise. If valve cannot be adjusted to proper limits a coarse adjustment must be made using the spring retainer.

4. If valve has been adjusted properly proceed to step (8).

5. Tighten locknut (A).

6. Loosen locknut (B).

7. If valve relieves below 100 psig, turn spring retainer 1 turn clockwise. If relieving above 120 psig, turn adjusting screw 1 turn counterclockwise. Tighten locknut (B). Repeat steps 2 thru 5 and adjust the valve to proper limits. It may be necessary to repeat this step to obtain proper setting. If valve cannot be adjusted to proper limits, it shall be disposed of in accordance with local directives.

8. Tighten both locknuts.

9. Retest valve in accordance with paragraph 7-64.

10. Remove valve assembly from test stand and disconnect test stand adapter from relief valve.

11. Lockwire valve from locknut (A) to locknut (B) to securing hole and apply Glyptal dot in accordance with figure 7-12.

7-66. ADJUSTMENT PROCEDURES (ESSEX RELIEF VALVE, P/N 20C-0050-2). Adjustment of the Essex Relief Valve (P/N 20C-0050-2) involves 2 potential adjustments (figure 7-12). The valve can normally be brought into tolerance with the pressure adjustment screw, however, adjustment of the spring retainer may be required.

Materials Required

Quantity	Description	Reference Number
As Required	Glyptal	1201B (CAGE 24452)
1	Hexagonal Nut	MS35649-242 or equivalent
As Required	Lockwire	MS20995C20
1	Machine Screw	MS35190-228 or equivalent

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-B5-8
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

It may be necessary to adjust the minimum (100 psig) relieving pressure to comply with the maximum allowable leakage (0.01 lpm). This is acceptable, provided the valve relieves 100 lpm at 100 to 120 psig.

1. Thread hexagonal nut on machine screw.

2. Thread machine screw/hex nut assembly into pressure adjustment screw approximately four turns.

3. While holding the machine screw with an appropriate screwdriver, tighten down the hexagonal nut with a 1/4-inch wrench.

4. Remove lockwire from lockscrews, remove Glyptal dots by applying a small amount of acetone.

5. Loosen lockscrew (A).

6. If valve relieves below 100 psig, turn pressure adjusting screw counterclockwise. If relieving above 120 psig, turn adjusting screw clockwise. If valve cannot be adjusted to proper limits a coarse adjustment must be made using the spring retainer.

7. If valve has been adjusted properly, proceed to step 11.

8. Tighten lockscrew (A).

9. Loosen lockscrew (B).

10. If valve relieves below 100 psig, turn spring retainer 1 turn clockwise. If relieving above 120 psig, turn adjusting screw 1 turn counterclockwise. Retighten lockscrew (B). Repeat steps 5 thru 8 and adjust the valve to proper limits. It may be necessary to repeat this step to obtain proper setting. If valve cannot be adjusted to proper limits, it shall be disposed of in accordance with local directives.

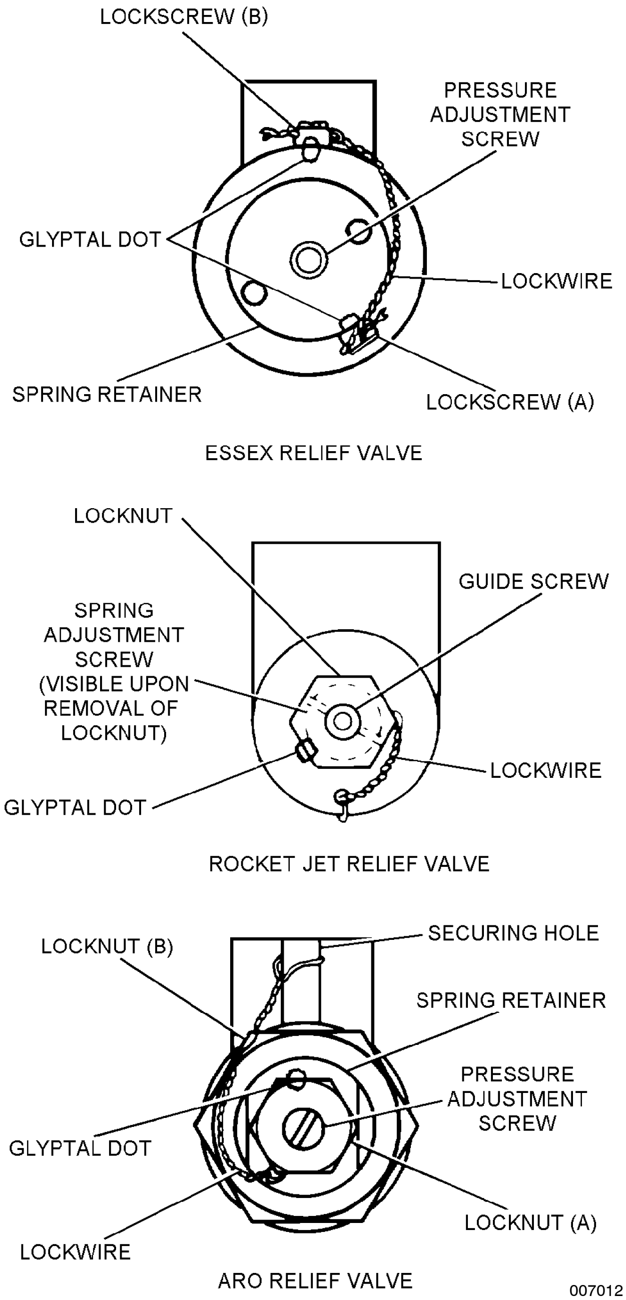


Figure 7-12. Application of Glyptal Dot(s) and Lockwire to Relief Valve.

11. Tighten both lockscrews.

12. Loosen hex nut and remove the machine screw/ hex nut assembly.

13. Retest valve in accordance with paragraph 7-64.

14. Remove valve assembly from test stand and disconnect test stand adapter from relief valve.

15. Lockwire and apply Glyptal dots in accordance with figure 7-12.

7-67. ADJUSTMENT PROCEDURES (ROCKET JET RELIEF VALVE P/N 10525-2). Adjustment of the Rocket Jet Relief valve (P/N 10525-2) involves 3 components of the valve (figure 7-12). The first is a locknut which is used for tightening the complete adjustment assembly. The second is a small guide screw located on the inside of the locknut, which is adjusted using an Allen wrench. This part is not responsible for the performance of the valve. The third part, the spring adjustment screw, adjusts the pressure at which the valve will relieve. It is located under the locknut and can be adjusted by a screwdriver only after removal of the locknut and the guide screw.

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-B5-8
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1
1	Plug Assembly, Test Stand	59A120-B5-16

NOTE

It may be necessary to adjust the minimum (100 psig) relieving pressure to comply with the maximum allowable leakage (0.01 lpm). This is acceptable, provided the valve relieves 100 lpm at 100 to 120 psig.

1. Remove lockwire from locknut, remove Glyptal dot by applying a small amount of acetone.

2. Remove locknut using a 3/8-inch wrench.

3. Remove guide screw using a 3/32-inch Allen wrench.

4. If valve relieves below 100 psig, turn spring adjustment screw clockwise with a screwdriver. If valve relieves above 120 psig, turn spring adjustment screw counterclockwise. It may be necessary to repeat this step to obtain proper setting. If spring adjustment screw is removed, teflon tape must be applied to ensure a proper seal. If valve cannot be adjusted to proper limits, it shall be disposed of in accordance with local directives.

5. Reinstall guide screw and turn clockwise until slight resistance is felt (screw bottomed out). Reinstall locknut.

CAUTION

Ensure spring adjustment screw does not turn out of adjustment while installing the guide screw and locknut.

6. Using the Allen wrench, turn the guide screw 2 full turns counterclockwise.

CAUTION

Extreme care should be taken towards keeping the guide screw in its adjusted position when tightening the locknut as deviation from this position could cause the valve not to relieve at any pressure.

7. Tighten the locknut ensuring that the Allen wrench and guide screw are in their adjusted positions.

8. Retest valve in accordance with paragraph 7-64.

9. Remove valve assembly from test stand and disconnect test stand adapter from relief valve.

10. Lockwire and apply Glyptal dot in accordance with figure 7-12.

7-68. PRESSURE CONTROL VALVE LEAKAGE TEST. To test the pressure control valve for leakage prior to installation, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	Connector Assembly, Test Stand	59A120-C5-18
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1
1	Plug Assembly, Test Stand	59A120-B5-16

NOTE

Refer to figure 7-13 for part nomenclature and port location.

1. Plug pressure control valve to supply manifold outlet with test stand plug assembly.

2. Attach pressure gage to pressure control valve to buildup port outlet.

3. Attach test stand connector assembly to pressure control valve to buildup coil inlet.

4. Attach pressure control valve to BELL JAR BOTTOM COUPLING (C-1).

5. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

6. Open OXYGEN SUPPLY valve (V-6) and apply 120 psig, as indicated on TEST PRESSURE gage (PG-1). Pressure gage attached to pressure control valve to buildup port should read between 55 and 90 psig.

NOTE

If outlet pressure does not fall within the 55 to 90 psig limit, adjust pressure control valve in accordance with paragraph 7-71, step 30.

7. Apply leak detection compound to valve body and bellows adjustment port. No leakage is allowed. If leakage is noted, replace valve assembly.

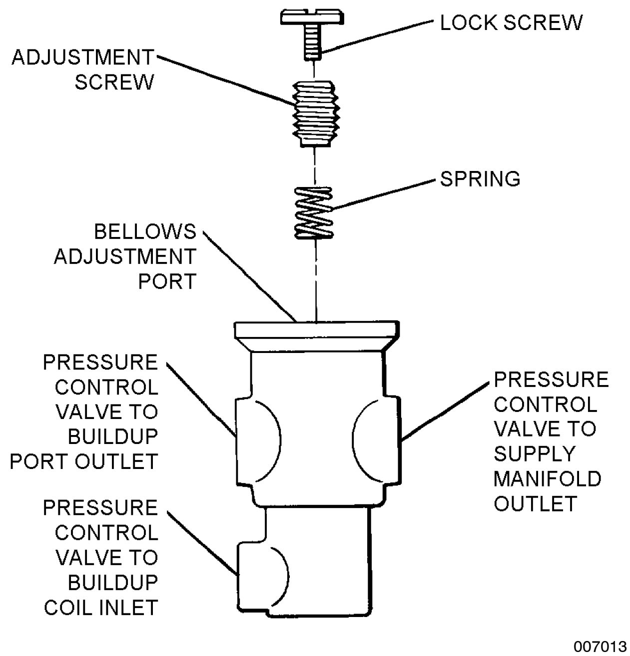


Figure 7-13. Pressure Control Valve

8. Ensure that 120 psig is indicated on TEST PRESSURE gage (PG-1). Hold pressure for 5 minutes. Any increase of pressure shown on gage attached to buildup port outlet indicates internal leakage and cause for rejection.

9. Close OXYGEN SUPPLY valve (V-6) and bleed test stand using SYSTEM BLEED valve (V-5).

10. Remove pressure control valve from test stand. Remove plug, gage, and connector from valve. Installation and further adjustments are performed in paragraph 7-71.

7-69. FILL, BUILDUP, AND VENT VALVE TEST. To test the fill, buildup, and vent valve for leakage prior to installation, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	Connector Assembly, Test Stand	59A120-C5-39
1	Hose Assembly, Stand, Test	59A120-B5-12
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1
1	Plug Assembly, Test Stand	59A120-B5-38

NOTE

The testing of the fill, buildup, and vent valve requires calculations. Use the blank space, after step 11 on the Performance Test Sheet to record measurements and perform calculations.

1. Plug gas and vent ports of valve using test stand plugs.

2. Attach test stand connector assembly to fill outlet port of valve.

3. Install fill, buildup, and vent valve with connector and plugs attached in test stand BELL JAR BOTTOM COUPLING (C-1).

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly when applying pressure to valve. Damage to test stand gages could result from surges in pressure.

4. Open TEST PRESSURE gage to BELL JAR valve (V-2) and close DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8).

5. Open OXYGEN SUPPLY valve (V-6) and apply 70 psig to valve assembly. Check for leakage around test stand plugs and couplings with leak detection compound. Correct any test stand leakage prior to proceeding.

6. Install test stand bell jar over fill, buildup, and vent valve, and secure in place.

7. Using test stand hose assembly, interconnect BELL JAR TOP COUPLING (C-2) and FLOWMETER connection (NIP-1).

8. Turn FLOWMETER SELECTOR valve (V-1) to the 0.0-0.25 lpm position.

CAUTION

When applying pressure in step 9, observe both TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2). Excessive leakage could damage FLOWMETER INDICATOR gage (PG-2).

9. Maintain 70 psig to the fill, buildup, and vent valve for 2 minutes. Leakage from the fill inlet port, indicated on FLOWMETER INDICATOR gage (PG-2) shall not exceed 0.02 lpm. Enter leakage measured on performance test sheet.

10. Close OXYGEN SUPPLY valve (V-6). Bleed pressure from test stand with SYSTEM BLEED valve (V-5).

CAUTION

Ensure pressure is bled from test stand prior to opening DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8). Overpressurization could damage DIFFERENTIAL PRESSURE gage (DF-1).

11. Open DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8).

CAUTION

When applying pressure in step 12, observe both DIFFERENTIAL PRESSURE gage (DF-1) and FLOWMETER INDICATOR gage (PG-2). Excessive leakage could damage FLOWMETER INDICATOR gage (PG-2).

12. Slowly open OXYGEN SUPPLY valve (V-6) to apply 10 inH_2O, as indicated on DIFFERENTIAL PRESSURE gage (DF-1). Maintain pressure for 2 minutes. Leakage, indicated on FLOWMETER INDICATOR gage (PG-2) shall not exceed 0.02 lpm. Enter leakage measured on Performance Test Sheet.

NOTE

If leakage in steps 9 or 12 exceeds 0.02 lpm, replace valve.

13. Close OXYGEN SUPPLY valve (V-6). Bleed pressure from test stand with SYSTEM BLEED valve (V-5). Close DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8).

14. Remove test stand bell jar. Remove test stand plug from vent port of fill, buildup, and vent valve.

15. Place test stand bell jar back in position over fill, buildup, and vent valve. Using test stand hose assembly interconnect BELL JAR TOP COUPLING (C-2) and FLOWMETER connection (NIP-1).

16. Turn FLOWMETER SELECTOR valve (V-1) to the 0.00.25 lpm position.

CAUTION

When applying pressure in step 17, observe both TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2). Excessive leakage could damage FLOWMETER INDICATOR gage (PG-2).

17. Open OXYGEN SUPPLY valve (V-6) and apply 70 psig to valve assembly. Maintain 70 psig to the fill, buildup, and vent valve for 2 minutes. Leakage from the vent port indicated on FLOWMETER INDICATOR gage (PG-2) shall not exceed 0.05 lpm. Enter leakage measured on Performance Test Sheet.

18. Close OXYGEN SUPPLY valve (V-6). Bleed pressure from test stand with SYSTEM BLEED valve (V-5).

CAUTION

Ensure pressure is bled from test stand prior to opening DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8). Overpressurization could damage DIFFERENTIAL PRESSURE gage (DF-1).

19. Open DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8).

CAUTION

When applying pressure in step 20 observe both DIFFERENTIAL PRESSURE gage (DF-1) and FLOWMETER INDICATOR gage (PG-2). Excessive leakage could damage FLOWMETER INDICATOR gage (PG-2).

20. Slowly open OXYGEN SUPPLY valve (V-6) to apply 10 inH_2O, as indicated on DIFFERENTIAL PRESSURE gage (DF-1). Maintain pressure for 2 minutes. Leakage, indicated on FLOWMETER INDICATOR gage (PG-2) shall not exceed 0.05 lpm. Enter leakage measured on Performance Test Sheet.

NOTE

Vent port leakage is determined by subtracting the leakage measured in step 9 from leakage measured in step 17 and subtracting the leakage measured in step 12 from leakage measured in step 20. Vent port leakage, in either case, shall not exceed 0.05 lpm.

21. If leakage in steps 15 or 18 exceeds 0.05 lpm, replace valve.

22. Close OXYGEN SUPPLY valve (V-6). Bleed pressure from test stand with SYSTEM BLEED valve (V-5). Close DIFFERENTIAL PRESSURE SHUT-OFF valve (V-8).

23. Remove test stand hose assembly from BELL JAR TOP COUPLING (C-2) and FLOWMETER connection (NIP-1). Remove bell jar.

24. Remove fill, buildup, and vent valve from test stand. Remove plug from gas port and connector from fill outlet port of valve. Set valve assembly aside. Installation will be covered later in this section.

7-70. COMPLETION OF ASSEMBLY.

7-71. To complete assembly of the converter, assemble components using index numbers in parentheses which refer to figure 7-14, and proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Glyptal	1201B (CAGE 24452)
As Required	Lockwire	MS20995C20
As Required	Tape, Anti-seize	MIL-T-27730

CAUTION

When installing tube assemblies, ensure fittings to which tube nuts are to be attached are properly aligned with tube to prevent crossthreading. Hold connecting fittings with open end wrench to avoid straining or breakage when tightening. Hold tubing away from other components of converter assembly while tightening so that a minimum 1/7-inch clearance is maintained. It may be necessary to slightly bend same tube assemblies to maintain this clearance. Ensure tubing is not crimped after bending process.

Use anti-seize tape on all male pipe thread fittings. Apply single layer of tape, overlapping ends just enough to avoid gap in tape when fitting is installed. To prevent tube blockage, ensure tape is clear of last thread.

Do not use anti-seize tape on flared or straight thread fittings.

NOTE

Do not tighten container assembly to the mounting base. Movement of container assembly is necessary to accomplish alignment adjustments during assembly of the converter.

1. Attach container assembly (67) to mounting base (72) with tie down assembly (65) and four nuts (66).

2. Assemble fitting (63), orifice assembly (62), 45° elbow (61), and nipple (60) to pressure control valve 17 (64).

3. Attach pressure control valve and fittings assembly to mounting base (72) with two screws (58) and two washers (59).

4. Install two pipe elbows (42 and 43) into gas and fill ports of combination fill, buildup, and vent valve (44). Install 90° elbow (38) and nipple (37) into pipe elbows (42 and 43).

5. Install vent port coupling half (36), plug (40), and nipple (37) into vent fitting (41).

6. Install assembled vent fitting and 45° elbow (39) into combination fill, buildup, and vent valve (44).

7. Attach fill, buildup, and vent valve and fittings assembly to converter mounting base (72) with two screws (33) and two nuts (35).

8. Position and attach valve strap (30) to converter mounting base using screws (31 and 32) and two nuts.

9. Attach supply manifold (57) to converter mounting base (72) with four screws (52) and four nuts (53).

10. Install two nipples (54) and relief valve (55) to supply manifold (57).

11. Install third nipple (54) to relief valve (55).

12. Install 90° elbow (50) and tee fitting (51) to container assembly (67).

13. Attach cover assembly (45) to fill, buildup, and vent valve using screw (28) and nut (29).

14. Attach carrying handle (26) to container to base tie down assembly (65) with two nuts (27).

15. Attach handle keeper (25) to container to base tie down assembly (65).

16. Install electrical connectors (23 and 24) into container assembly (67).

17. Attach dust caps (17 and 20) to container using screws (18 and 21) and nuts (19 and 22).

18. Attach pressure control valve to supply manifold tube assembly (16) to 45° elbow (61) and nipple (54).

19. Attach supply tube assembly (12) to orifice assembly (62) and the bottom nipple (54) on supply manifold (57).

20. Attach two clamps (13) securing tube assemblies (12 and 16) with screw (14) and nut (15).

21. Attach pressure control valve to liquid port tube assembly (11) to fitting (63) and tee fitting (51).

22. Attach pressure control valve to buildup port assembly (7) to 45° elbow (39) and nipple (60).

23. Attach two clamps (8) to secure tube assemblies (11) with screw (9) and nut (10).

24. Attach fill tube assembly (6) to tee fitting (51) and 90° elbow (38).

25. Attach tube assembly (5) to nipple (37) and 90° elbow (50).

26. Attach fill valve to manifold tube assembly (1) to nipple (54) on relief valve and nipple (37) on vent fitting.

27. Attach clamp (2) securing tube assembly (1) to container using screw (3) and lock washer (4).

28. Secure container assembly to mounting base by tightening four nuts (66).

NOTE

During the post assembly bench test, it may be necessary to adjust the pressure control valve. If adjustment is required, perform steps 30a through 30d.

29. Bench test assembled converter in accordance with paragraph 7-40.

30. To adjust the pressure control valve, proceed as follows:

NOTE

Refer to figure 7-13 for part nomenclature.

a. Cut and remove lockwire from lock screw. Remove Glyptal dot by applying a small amount of acetone.

b. Remove lock screw from adjustment screw.

NOTE

The 70 to 75 psig operating pressure is for adjustment purposes only. If converter maintains 55 to 90 psig, no adjustment is required. If converter pressure is above or below this range, adjust pressure closing valve to maintain 70 to 75 psig.

c. Using a screwdriver, turn adjustment screw so supply pressure of 70 to 75 psig is maintained with a flow of 120 lpm. Turn adjustment screw clockwise to decrease pressure and counterclockwise to increase pressure. Flow converter for at least 30 minutes to ensure pressure is constant.

d. Install lock screw and safety wire to secure.

e. Apply Glyptal dot to lock screw.

Section 7-5. Illustrated Parts Breakdown

7-72. GENERAL.

7-73. This section lists and illustrates the assemblies and detail parts of the Liquid Oxygen Converter Assembly, Type GCU-24/A, P/Ns 21170-10/-13, manufactured by Carleton Technologies Inc., formerly ARO Corporation (CAGE 03991).

7-74. The Illustrated Parts Breakdown should be used during maintenance when requisitioning and identifying parts.

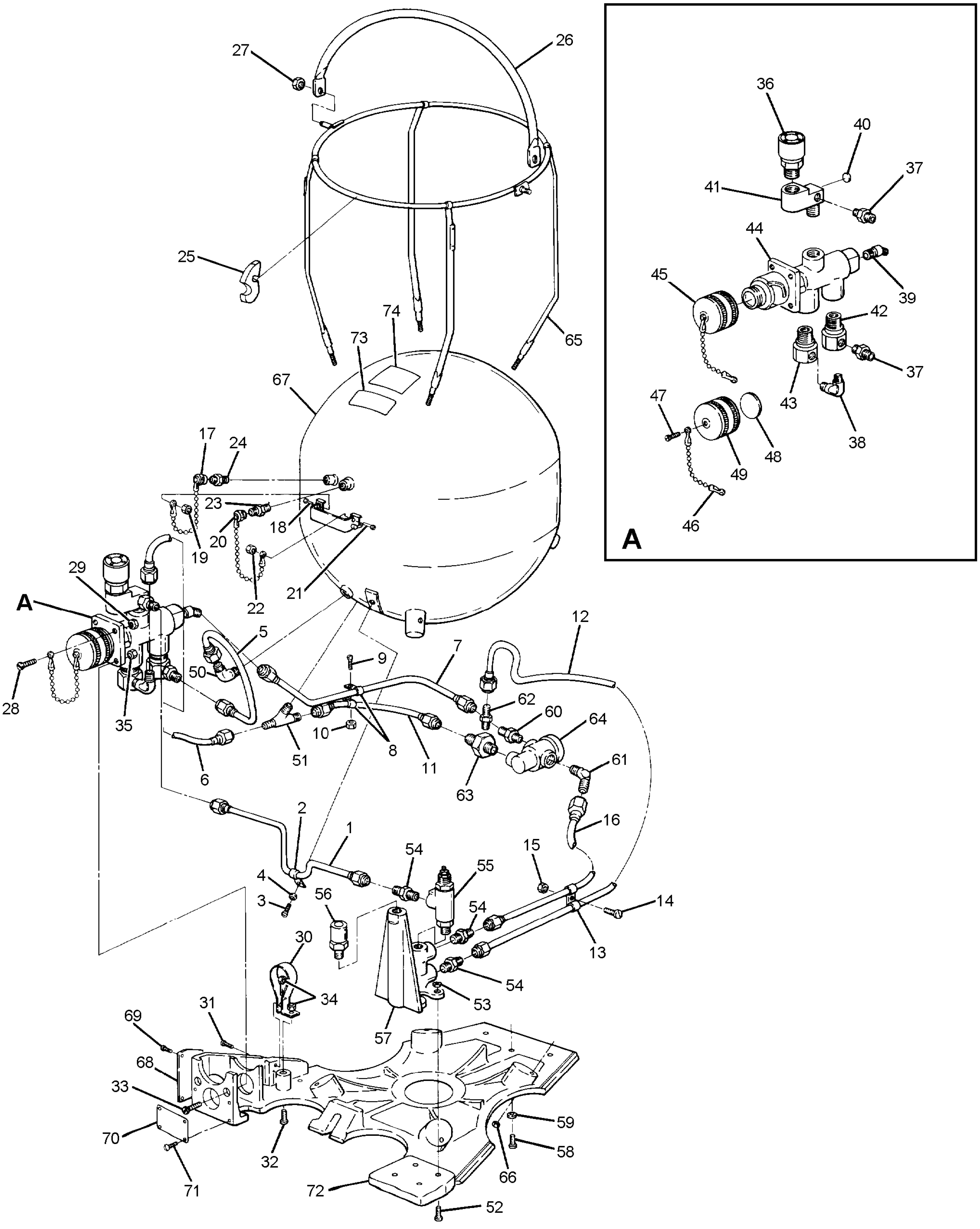


Figure 7-14. Liquid Oxygen Converter Assembly, Type GCU-24/A, P/Ns 21170-10/-13

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
7-14	21170-10	CONVERTER ASSEMBLY, Liquid oxygen, 10 liter	1	A
	21170-13	CONVERTER ASSEMBLY, Liquid oxygen, 10 liter	1	B
-1	904928	. TUBE ASSEMBLY, Fill valve to manifold (ATTACHING PARTS)	1	
-2	10884	. CLAMP, Tube	1	
-3	AN515C8R3	. SCREW	1	
-4	AN936A8	. WASHER, Lock ---*---	1	
-5	905053	. TUBE ASSEMBLY	1	
-6	F7405178-1	. TUBE ASSEMBLY, Fill	1	
-7	905044	. TUBE ASSEMBLY, Pressure control valve to buildup port (ATTACHING PARTS)	1	
-8	10884	. CLAMP, Tube	2	
-9	AN515C6-6	. SCREW	1	
-10	MS20365D632	. NUT ---*---	1	
-11	905043	. TUBE ASSEMBLY, Pressure control valve to liquid port	1	
-12	905081	. TUBE ASSEMBLY, Supply (ATTACHING PARTS)	1	
-13	10884	. CLAMP, Tube	2	
-14	AN515C6-6	. SCREW	1	
-15	MS20365D632	. NUT ---*---	1	
-16	905082	. TUBE ASSEMBLY, Pressure control valve to supply manifold	1	
-17	900092	. CAP, Dust “B” polarity (ATTACHING PARTS)	1	
-18	AN515C4-5	. SCREW	1	
-19	MS20365D440	. NUT ---*---	1	
-20	900093	. CAP, Dust “E” polarity (ATTACHING PARTS)	1	
-21	AN515C4-5	. SCREW	1	
-22	MS20365D440	. NUT ---*---	1	
-23	900271	. CONNECTOR, Electrical	1	
-24	900272	. CONNECTOR, Electrical	1	
-25	904950	. KEEPER, Handle	1	
-26	F7405182-1	. HANDLE, Carrying (ATTACHING PARTS)	1	
-27	904647	. NUT, Self-locking ---*---	2	

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
7-14-28	AN515C6-8	. SCREW	1	
-29	MS20365D632	. NUT	1	
	904944	. VALVE AND FITTINGS ASSEMBLY, Fill, buildup, and vent	1	A
	905236-1	. VALVE AND FITTINGS ASSEMBLY, Fill, buildup, and vent	1	B
		(ATTACHING PARTS)		
-30	F7405162-1	. STRAP, Valve	1	
-31	AN515C8-8	. SCREW	1	
-32	AN515C8-12	. SCREW	1	
-33	AN510C10-11	. SCREW	2	
-34	MS20365D832	. NUT	2	
-35	MS20365D1032	. NUT	2	
		---*---		
-36	901440	. . COUPLING HALF, Vent port	1	
-37	AN816-5D	. . NIPPLE	2	
-38	MS20822-5D	. . ELBOW, 90°	1	
-39	AN823-5D	. . ELBOW, 45°	1	
-40	AN932D2	. . PLUG	1	
-41	F7405114-1	. . FITTING, Vent	1	
-42	900800	. . ELBOW, Pipe	1	
-43	901308	. . ELBOW, Pipe	1	
-44	21088-8 439000-3	. . VALVE, Combination fill, buildup, and vent, liquid oxygen	1	A
	21088-13 0580560100-1	. . VALVE, Combination, fill, buildup, and vent, liquid oxygen	1	B
	21088-15 CRU-50A	. . VALVE, Combination fill, buildup, and vent, liquid oxygen	1	
-45	905071	. . . COVER ASSEMBLY, Fill valve	1	B
	904600	. . . COVER ASSEMBLY, Fill valve	1	A
-46	12914	. . . . CHAIN, Male fill valve	1	
		(ATTACHING PARTS)		
-47	AN500-5-5	. . . . SCREW	1	
		---*---		
-48	904793	. . . . SPACER	1	
-49	905071	. . . . COVER, Fill valve	1	
-50	MS20822-5D	. ELBOW, 90°	1	
-51	AN825-5D	. TEE, Fitting	1	
	904932	. MANIFOLD ASSEMBLY, Supply	1	
		(ATTACHING PARTS)		
-52	AN510C10-16	. SCREW	4	
-53	MS20365D1032	. NUT	4	
		---*---		
-54	AN816-5D	. . NIPPLE	3	
-55	21247-1	. . VALVE, Relief, oxygen, aircraft, Type II (Note 1)	1	

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
7-14-56	904645	. . COUPLING HALF, Quick-disconnect	1	
-57	905079	. . MANIFOLD, Supply	1	
	905080	. VALVE AND FITTINGS ASSEMBLY, ... Pressure control (ATTACHING PARTS)	1	
-58	AN505C8-6	. SCREW	2	
-59	AN936C8	. WASHER .... ---*---	2	
-60	AN816-5D	. . NIPPLE	1	
-61	MS20823-5D	. . ELBOW, 45°	1	
-62	904942	. . ORIFICE ASSEMBLY	1	
-63	900794	. . FITTING	1	
-64	21259	. . VALVE, Pressure control	1	
-65	904949	. TIE DOWN ASSEMBLY, Container to base ..... (ATTACHING PARTS)	1	
-66	MS20365D1032	. NUT .... ---*---	4	
-67	904927	. CONTAINER ASSEMBLY, Inner and outer	1	
-68	F7405184-1	. PLATE, Vacuum performance .... (ATTACHING PARTS)	1	
-69	AN535-00-2	. SCREW, Drive .... ---*---	4	
-70	904437	. PLATE, Identification .... (ATTACHING PARTS)	1	
-71	AN535-00-2	. SCREW, Drive .... ---*---	4	
-72	F7405112-2	. BASE, Converter mounting	1	
-73	900565	. DECAL, Warning	1	
-74	CL227C2-1	. DECAL, Bench test date	1	

Notes: 1. Relief valves P/N 20C-0050-2 (CAGE 19062), P/N 10525-2 (CAGE 03990), and 21247-1 (CAGE 03990) are interchangeable.

NUMERICAL INDEX

Part Number	Figure and Index Number	SM&R Code
AN500-5-5	7-14-47	
AN505C8-6	7-14-58	
AN510C10-11	7-14-33	
AN510C10-16	7-14-52	
AN515C4-5	7-14-18	
	7-14-21	
AN515C6-6	7-14-9	PAOZZ
	7-14-14	
AN515C6-8	7-14-28	PAOZZ
AN515C8-12	7-14-32	PAOOZ
AN515C8-8	7-14-31	PAOOZ
AN515C8R3	7-14-3	
AN535-00-2	7-14-69	
	7-14-71	
AN816-5D	7-14-37	PAOZZ
	7-14-54	
	7-14-60	
AN823-5D	7-14-39	PAOZZ
AN825-5D	7-14-51	PAOZZ
AN932D2	7-14-40	PAOZZ
AN936A8	7-14-4	
AN936C8	7-14-59	
CL227C2-1	7-14-74	
F7405112-2	7-14-72	
F7405114-1	7-14-41	PAOZZ
F7405162-1	7-14-30	
F7405178-1	7-14-6	PAOZZ
F7405182-1	7-14-26	
F7405184-1	7-14-68	
MS20365D1032	7-14-35	
	7-14-53	
	7-14-66	
MS20365D440	7-14-19	
	7-14-22	
MS20365D632	7-14-10	
	7-14-15	
	7-14-29	
MS20365D832	7-14-34	
MS20822-5D	7-14-38	PAOZZ
	7-14-50	
MS20823-5D	7-14-61	PAOZZ
10884	7-14-2	
	7-14-8	
	7-14-13	
12914	7-14-46	
21088-13	7-14-44	PAOZZ
21088-8	7-14-44	
21170-10	7-14-	PAOGD
21170-13	7-14-	PAOGD
21088-15	7-14-44	PAOZZ
21247-1	7-14-55	PAOZZ
21259	7-14-64	PAOZZ
900092	7-14-17	PAOZZ
900093	7-14-20	PAOZZ
900271	7-14-23	PAOZZ
900272	7-14-24	PAOZZ
900565	7-14-73	
900794	7-14-63	PAGZZ
900800	7-14-42	PAOZZ
901308	7-14-43	PAOZZ
901440	7-14-36	PAOZZ
904437	7-14-70	
904600	7-14-	PAOZZ
904645	7-14-56	PAOZZ
904647	7-14-27	
904793	7-14-48	PAOZZ
904927	7-14-67	
904928	7-14-1	PAOZZ
904932	7-14-	
904942	7-14-62	PAOZZ
904944	7-14-	
904949	7-14-65	PAOZZ
904950	7-14-25	
905043	7-14-11	PAOZZ
905044	7-14-7	PAOZZ
905053	7-14-5	PAOZZ
905071	7-14-45	PAOZZ
	7-14-49	
905079	7-14-57	PAOZZ
905080	7-14-	
905081	7-14-12	PAOZZ
905082	7-14-16	PAOZZ
905236-1	7-14-	PAOZZ

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CHAPTER 8

LIQUID OXYGEN CONVERTER ASSEMBLY

TYPE GCU-( )/A, P/N 3263004-0201

Section 8-1. Description

8-1. GENERAL.

8-2. The Liquid Oxygen Converter Assembly, Type GCU-( )/A, P/N 3263004-0201, is manufactured by Litton Life Support, formerly Bendix Corporation (CAGE 99251). The converter assembly is designed to store and convert liquid oxygen (LOX) into gaseous oxygen for the aircrewmember during flight (figure 8-1). Table 8-1 contains the leading particulars for the converter assembly.

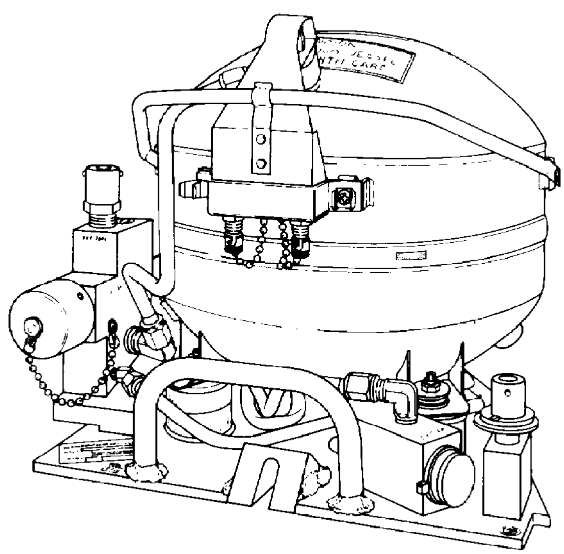

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Figure 8-1. Liquid Oxygen Converter Assembly, Type GCU-( )/A, P/N 3263004-0201

Table 8-1. Leading Particulars

Capacity (LOX) 3263004-0201	5 liters
Operating pressure	55 to 90 psig
Operating temperature range	-65°F (-54°C) to +260°F (+127°C)
Relief valve setting	100 to 120 psig
Pressure Control valve setting	55 to 90 psig
Delivery rate	120 lpm (min)
Filling time at 70°F	10 min
Buildup time (max)	5 min

8-3. Oxygen in its liquid state (approximately -297°F (-182°C)), is stored in a spherical assembly consisting of inner and outer shells separated by an annular space. The annular space is evacuated, creating a vacuum which prevents the transmittal of heat through the space. The thermos bottle effect created retards heating and eventual conversion of LOX to gaseous oxygen. Valves, tubing and fittings incorporated in the converter assembly convert LOX to gas and direct its flow at a controlled rate.

8-4. CONFIGURATION.

8-5. The Liquid Oxygen Converter Assembly, Type GCU-( )/A, P/N 3263004-0201, consists of a container assembly, combination valve with relief valve incorporated, pressure closing valve, and associated tubing and fittings. A capacitance-type probe assembly, which sends an electrical signal to a liquid oxygen quantity gage located in the aircraft, is incorporated within the container assembly. The quantity gage indicates the amount of LOX contained in the converter.

8-6. FUNCTION.

8-7. The operational characteristics and performance for which the GCU-( )/A converter assembly (P/N 3263004-0201) is designed are as follows:

1. The converter is filled by attaching the LOX servicing trailer filler valve to the filler port of the combination valve on the converter. When attached, the servicing trailer filler valve depresses the nosepiece and valve poppet of the combination valve. This automatically puts the converter into the fill mode (figure 8-2).

2. With the poppet depressed, the fill and vent ports of the combination valve are opened and the buildup port is closed. This condition allows gas pressure built up in the inner container to vent to the atmosphere. As pressure is vented, LOX in the servicing trailer (which is at a greater pressure 30 psig), flows through the combination valve and into the converter.

3. As the LOX level rises in the container, pressure created by vaporization of liquid due to heat, turbulence, etc, is vented to the atmosphere. The converter is considered full when LOX flows in a steady stream from the overboard vent line coupling assembly.

4. When the converter is full and the servicing trailer filler valve is disconnected, the nosepiece and poppet of the combination valve return to the extended position (figure 8-3). This automatically puts the converter into the buildup and supply mode. In this mode the fill and vent ports are closed and the buildup port is open.

5. In the buildup and supply mode, LOX is forced out of the bottom of the inner container and into the buildup coil by the weight of the liquid (figure 8-3). As the LOX warms and vaporizes into gaseous oxygen in the buildup coil, pressure is created. This pressure is controlled at approximately 75 psig by the opening and closing action of the pressure closing valve.

6. Gaseous oxygen travels from the buildup coil through the supply coupling assembly and the heat exchanger to a shut-off valve in the aircraft cockpit.

7. Gaseous oxygen, under pressure, also passes through the gas and buildup ports of the combination valve to the upper portion of the pressure closing valve. A bellows, inside the pressure closing valve, holds the valve in the open position. As pressure builds, the bellows senses the increase, contracts (at approximately 75 psig), and closes the valve.

8. If no demand is placed on the converter, pressure continues to slowly rise. If allowed to go unchecked, pressure in excess of 12,000 psig could be generated. To prevent this potentially hazardous situation, a relief valve is incorporated. The relief valve is set to relieve excess pressure in the converter assembly at approximately 110 psig.

9. As a demand is placed on the converter by the aircrewmember, LOX is forced into the buildup coil to replace consumed oxygen. As this process is repeated, the LOX level in the converter drops, increasing the void area at the top. As the size of the void area increases, pressure decreases and is sensed by the bellows in the pressure closing valve. When pressure falls below approximately 75 psig, the bellows expands, opening the valve. With the valve open, pressure from the buildup coil passes through the valve and into the top of the converter. This pressure, coupled with the pressure created by vaporizing LOX contained in the converter, again builds to approximately 75 psig and closes the pressure closing valve. This process is repeated as long as a demand is placed on the converter.

10. A heat exchanger is incorporated into the aircraft tubing to further warm the gaseous oxygen to a breathable temperature.

11. An additional relief valve, set at approximately 115 psig is installed in the aircraft oxygen plumbing to provide additional protection against over-pressurization of the converter and supply lines of the system.

8-8. SERVICE LIFE.

8-9. Liquid oxygen converters shall remain in service as long as they continue to function properly.

8-10. REFERENCE NUMBERS, ITEMS, AND SUPPLY DATA.

8-11. Section 8-5, Illustrated Parts Breakdown, contains information on the converter assembly, subassemblies, and component parts. Figure and index numbers, reference or part numbers, description, and units per assembly are provided with the breakdown.

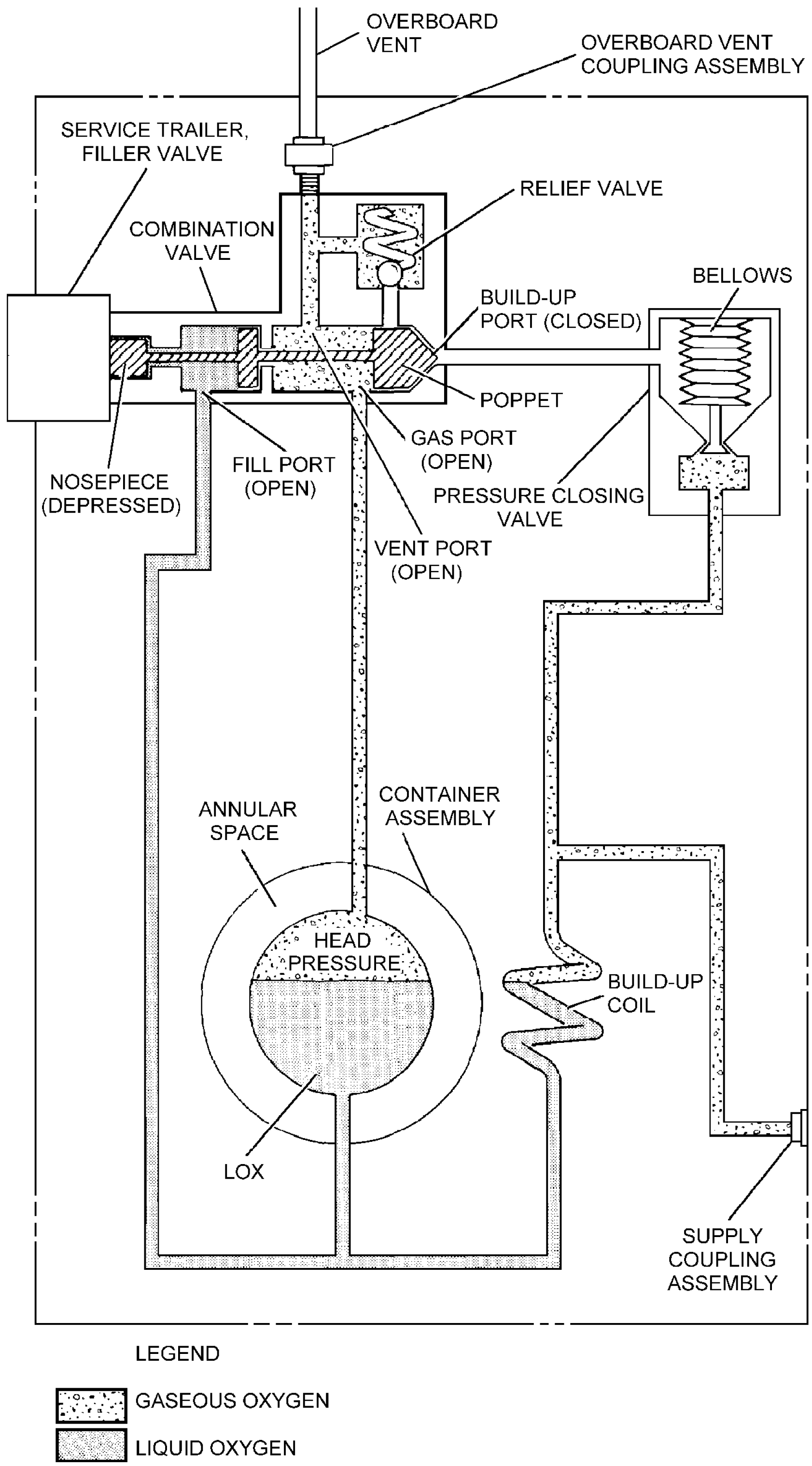


Figure 8-2. Fill Mode (Converter Removed from Aircraft)

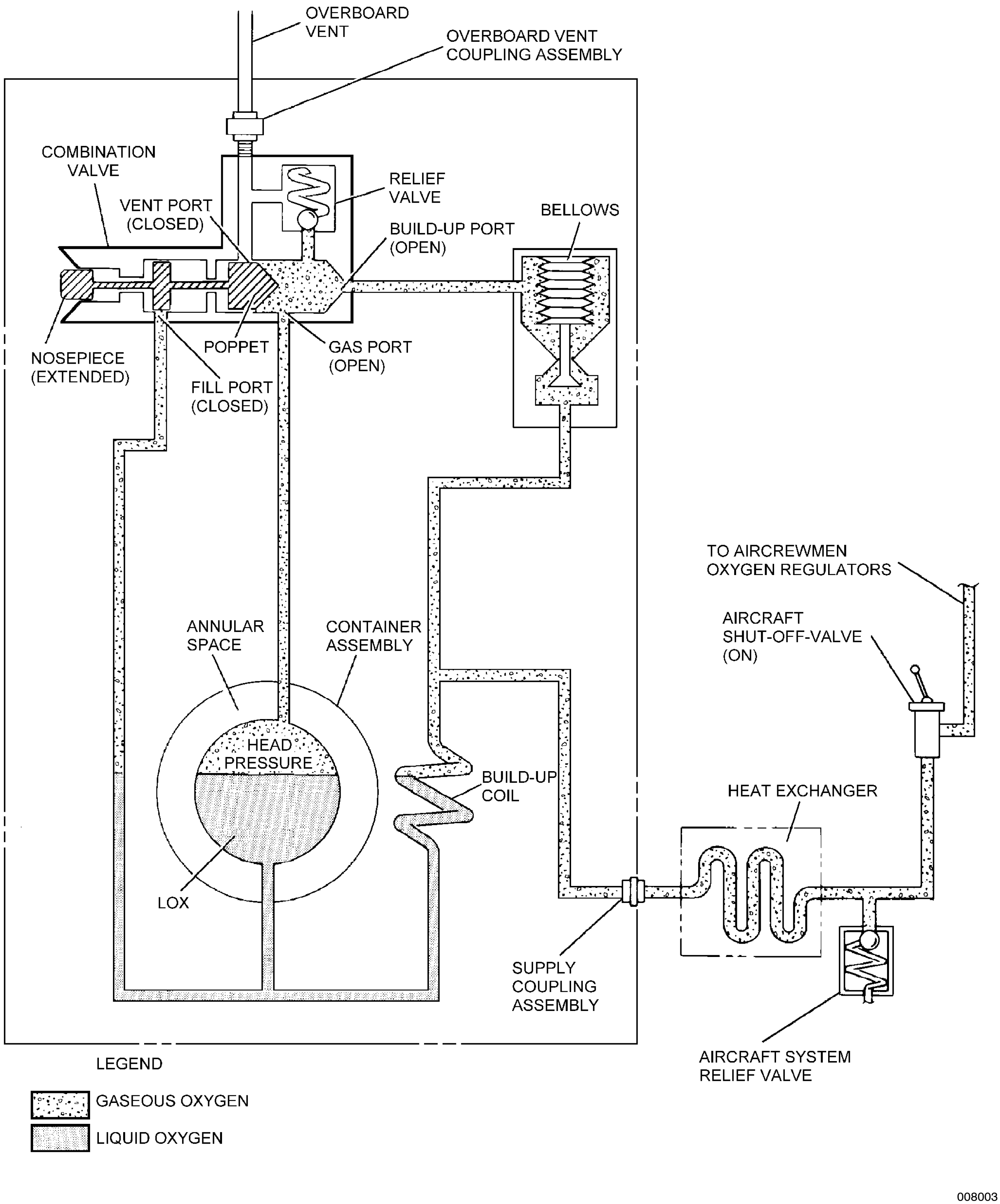


Figure 8-3. Buildup and Supply Mode (Converter Installed)

Section 8-2. Modifications

8-12. GENERAL.

8-13. There are no modifications to the GCU-( )/A, P/N 3263004-0201 required/authorized at this time.

Section 8-3. Performance Test Sheet Preparation

8-14. GENERAL.

8-15. Preparation of the Liquid Oxygen Converter Performance Test Sheet utilized during the bench test requires entering the appropriate indicated flows and pressures in the spaces provided (figure 8-4). The indicated flows and pressures shall be extracted from the test stand calibration correction cards. See appropriate ground support equipment manual.

8-16. The test stand calibration correction cards contain all actual flows and pressures required to test all known models of liquid oxygen converters presently in service. Converting actual flows and pressures to indicated flows and pressures is normally accomplished during calibration of the test stand. Refer to appropriate ground support equipment manual for calibration intervals.

8-17. The Performance Test Sheets shall be prepared as shown in figure 8-4. The Performance Test Sheet shown is a sample but can be reproduced for local use.

8-18. The following tests require the extraction of appropriate indicated flows and/or pressures from the test stand calibration correction cards:

1. Converter Leakage Test
2. Relief Valve Test
3. Fill and Buildup Time Test
4. Flow Test
5. Converter Charge

NOTE

For correction card numbers refer to appropriate ground support equipment manual.

8-19. CONVERTER PERFORMANCE TESTS.

8-20. CONVERTER LEAKAGE TEST. The Converter Leakage Test is performed with the converter pressurized with gaseous oxygen to 95 psig. Locate the indicated psig for the actual 95 psig on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

8-21. RELIEF VALVE TEST. The relief valve shall vent at least 100 liters per minute (lpm) with an applied pressure of 100 to 120 psig. The maximum allowable leakage with 100 psig applied is 0.01 lpm. Make the following entries on the Performance Test Sheet:

1. Locate indicated inches of water (inH_2O) for 100 lpm on correction card number 4. Enter indicated inH_2O in space provided on Performance Test Sheet.

2. Locate indicated psig for actual pressures of 95, 100 and 120 psig on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

3. Locate indicated inH_2O for actual flow of 0.01 lpm on correction card number 7. Enter indicated inH_2O in space provided on Performance Test Sheet.

PERFORMANCE TEST SHEET
TYPE GCU-29/A LIQUID OXYGEN CONVERTER ASSEMBLY
(BENDIX CORPORATION P/N 3263004-0201)

DATE: ____________ CONVERTER SERIAL NO: ____________ TEST STAND SERIAL NO: ____________

OPERATOR: ____________ CDI: ____________ TARE WEIGHT: ____________

1. CONVERTER PURGE (PURGE 30 MINUTES AT 200°F (93°C) TO 250°F (121°C) AND AT 120 PSIG).

2. INSULATION RESISTANCE TEST (EMPTY).

CONNECTION	MINIMUM ALLOWABLE MEGOHMS	READING
A TO B	2.0	
A TO GROUND	1.0	
B TO GROUND	1.0	

3. CAPACITANCE TEST (EMPTY) READING SHALL BE 121.5 TO 125.5 MICROMICROFARADS (UUF) ____________

4. RELIEF VALVE TEST

VENT FLOW						LEAKAGE					
INLET PRESS (PSIG)			FLOW			INLET PRESS (PSIG)			FLOW		
ACTUAL	INDICATED	PG-1 READING	ACTUAL (LPM)	INDICATED (INH_2O)	PG-2 READING	ACTUAL	INDICATED	PG-1 READING	ACTUAL (LPM)	INDICATED (INH_2O)	PG-2 READING
100			100			95			0.01		
120											

5. CONVERTER LEAKAGE TEST

95 PSIG ACTUAL = ____________ PSIG INDICATED, WITH INDICATED PSIG APPLIED THERE SHALL BE NO LEAKAGE FROM THE PRESSURE CONTROL VALVE, BUILDUP COIL, TUBING AND FITTINGS.

6. FILL AND BUILDUP TIME TEST

A. FILL TIME (MAXIMUM TIME ALLOWED IS 10 MINUTES) ____________

B. BUILDUP TIME (MAXIMUM TIME TO BUILDUP TO 55 TO 90 PSIG IS 5 MINUTES) PSIG ACTUAL = ________ PSIG INDICATED TIME REQUIRED FOR BUILUP ________ MINUTES.

7. CAPACITANCE TEST (FULL)

TOTAL CONVERTER WEIGHT	
CONVERTER TARE WEIGHT	
LOX WEIGHT (W)	
2.33 X W + 64.0 = C (MAX)	
2.25 X W + 63.0 = C (MIN)	
READING	
C = CAPACITANCE IN UUF	W = WEIGHT OF LOX IN POUNDS

Figure 8-4. Converter Performance Test Sheet (Sheet 1 of 2)

8. FLOW TEST (120 LPM WHILE MAINTAINING 55 TO 90 PSIG WORKING PRESSURE)

<table>
<tr><th colspan="2">WORKING PRESS.
(PSIG)</th><th colspan="2">FLOW
(LPM)</th><th rowspan="2">PG-2
READING</th></tr>
<tr><th>ACTUAL</th><th>PG-1
INDICATED</th><th>ACTUAL</th><th>INDICATED</th></tr>
<tr><td>55</td><td></td><td rowspan="2">120</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>90</td><td></td></tr>
</table>

9. EVAPORATION LOSS TEST (BUILDUP AND SUPPLY MODE) MAXIMUM ALLOWABLE LOSS OF LOX IN 24 HOURS IS 3.0 LBS.

NOTE: LOX IN CONVERTER MUST BE STABILIZED FOR 1 HOUR PRIOR TO BEGINNING TEST. DO NOT AGITATE CONVERTER DURING 24 HOUR PERIOD.

A. START TIME ______________________ START WEIGHT ______________________

B. FINISH TIME ______________________ FINISH WEIGHT ______________________

10. EVAPORATION LOSS TEST (VENTED MODE)
MAXIMUM ALLOWABLE LOSS OF LOX IN 24 HOURS IS 5.0 LBS. (PERFORMED ONLY IF CONVERTER FAILS EVAPORATION LOSS TEST IN BUILDUP AND SUPPLY MODE)

A. START TIME ______________________ START WEIGHT ______________________

B. FINISH TIME ______________________ FINISH WEIGHT ______________________

11. CONVERTER CHARGE (OXYGEN)

<table>
<tr><th colspan="2">PRESSURE
(PSIG)</th><th></th></tr>
<tr><th>ACTUAL</th><th>INDICATED</th><th>READING</th></tr>
<tr><td>25</td><td></td><td></td></tr>
<tr><td>30</td><td></td><td></td></tr>
</table>

Figure 8-4. Converter Performance Test Sheet (Sheet 2 of 2)

8-22. FILL AND BUILDUP TIME TEST. The time required to fill the converter (5 liters) shall not exceed 10 minutes at a filling pressure of 30 psig.

8-23. The time required for the filled converter to build up a working pressure of 55 to 90 psig shall not exceed 5 minutes from time the servicing trailer filler valve is disconnected from converter. Locate indicated psig for the actual psig pressure on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

8-24. FLOW TEST. The converter shall be capable of delivering gaseous oxygen at the rate of 120 lpm while maintaining pressure of 55 to 90 psig. Make the following entries on the Performance Test Sheet:

1. Locate indicated inH_2O for actual flow of 120 lpm on correction card number 4. Enter indicated inH_2O in space provided on Performance Test Sheet.

2. Locate indicated psig for actual pressures of 55 to 90 psig on correction card number 2. Enter actual psig in spaces provided on Performance Test Sheet.

8-25. CONVERTER CHARGE. Upon completing the Bench Test, the converter shall be emptied of LOX and pressurized with gaseous oxygen 25 to 30 psig. This prevents moisture from entering the converter during shipment/storage. Locate indicated psig for actual pressures of 25 and 30 psig on correction card number 2. Enter indicated psig in spaces provided on Performance Test Sheet.

Section 8-4. Maintenance

8-26. GENERAL.

8-27. This Section contains the procedural steps for the inspection, testing, troubleshooting, disassembly, cleaning, repair, assembly, and adjusting of the Liquid Oxygen Converter Assembly, Type (GCU-( )/A, (P/N 3263004-0201).

NOTE

Upon completion of any maintenance action (e.g., inspection, repair, modification, etc), be sure to complete the required Maintenance Data Collection System forms.

8-28. EMERGENCY PRESSURE RELIEF PROCEDURES. When filling the converter, or at anytime, if any of the following situations are encountered: Heavy frosting, icing, or excessive pressure buildup (in excess of 130 psig), perform the following immediately.

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Fixture, Test, Valve, Gage/Relief, Pressure	Fabricate IAW figure 8-6

Support Equipment Required (Cont)

Quantity	Description	Reference Number
1	Line, Drain, Port, Vent	Fabricate IAW figure 8-7
1	Line, Drain, Converter, LOX	Fabricate IAW figure 8-8

WARNING

LOX in a non-vented container will build to 12,000 psig. Converters however, will explode at approximately 1,200 psig.

Do not attempt to relieve pressure in LOX converters that indicate critical over-pressurization (figure 8-5). For these converters comply with procedures as prescribed in the individual station/ships emergency procedures bill.

1. Attach pressure gage/relief valve test fixture (figure 8-6) to supply quick-disconnect coupling (17).

2. Attach vent port drain line (figure 8-7) to converter vent port coupling (34). Ensure vent port drain line faces away from operator.

3. Ensure adapter knurl knob is backed out counterclockwise.

WARNING

When performing step 4, if excessive pressure does not relieve through vent port drain line, immediately comply with procedures as prescribed in the individual station/ships emergency procedures bill.

4. Install adapter to the fill port of fill, buildup, and vent valve (35) and relieve pressure from the converter by turning the knurl knob of the adapter clockwise four full turns (this places the converter in the vented mode).

5. Observe the pressure gage/relief valve test fixture until 70 psig is indicated.

6. Remove pressure gage/relief valve test fixture and adapter.

WARNING

When performing step 7, if LOX fails to drain from the converter, disconnect LOX converter drain line, attach adapter to fill, buildup, vent valve (34) and turn knurl knob clockwise 4 full turns. (Organizational Level transport defective converter to AIMD immediately).

7. Immediately place converter in a LOX drain pan, attach LOX converter drain line (figure 8-8) to supply quick-disconnect coupling (40) and drain LOX from the converter.

8. Organizational Level forward the defective LOX converter to AIMD for Bench Test.

8-29. INSPECTION.

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical overpressurization, immediately comply with the emergency pressure relief procedures given in paragraph 8-28 at the beginning of this section.

8-30. ACCEPTANCE/TURNAROUND/DAILY/PREFLIGHT/POSTFLIGHT AND TRANSFER INSPECTIONS. The Acceptance/Turnaround/Daily/Preflight/Postflight and Transfer Inspections consist of a Visual Inspection followed by a Functional Test. These inspections and tests shall be performed in conjunction with the aircraft inspection requirements for the aircraft in which the converter is installed. Refer to table 8-2 for troubleshooting assistance.

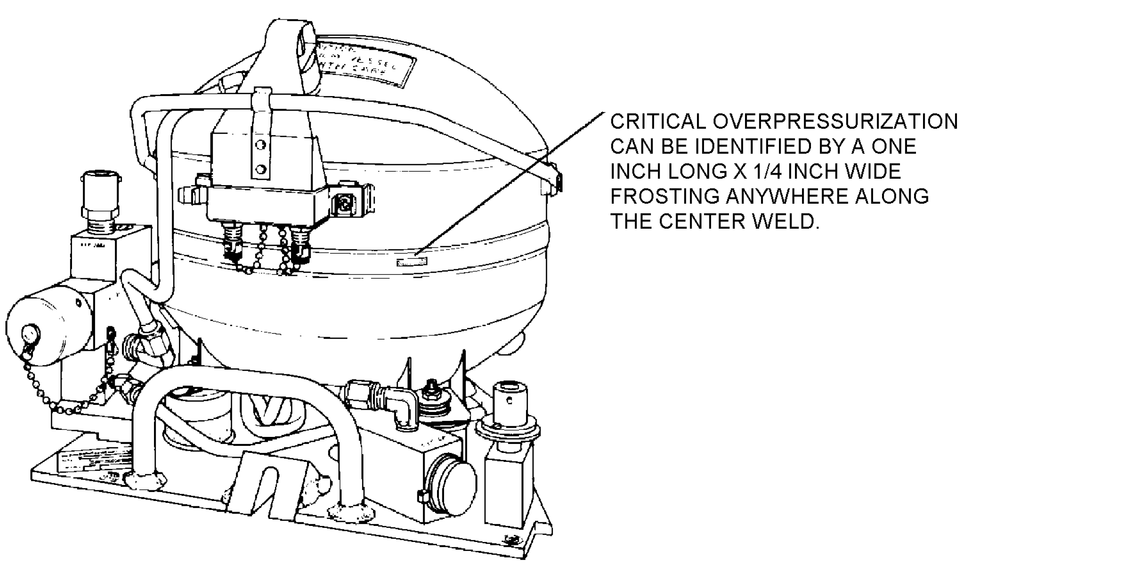
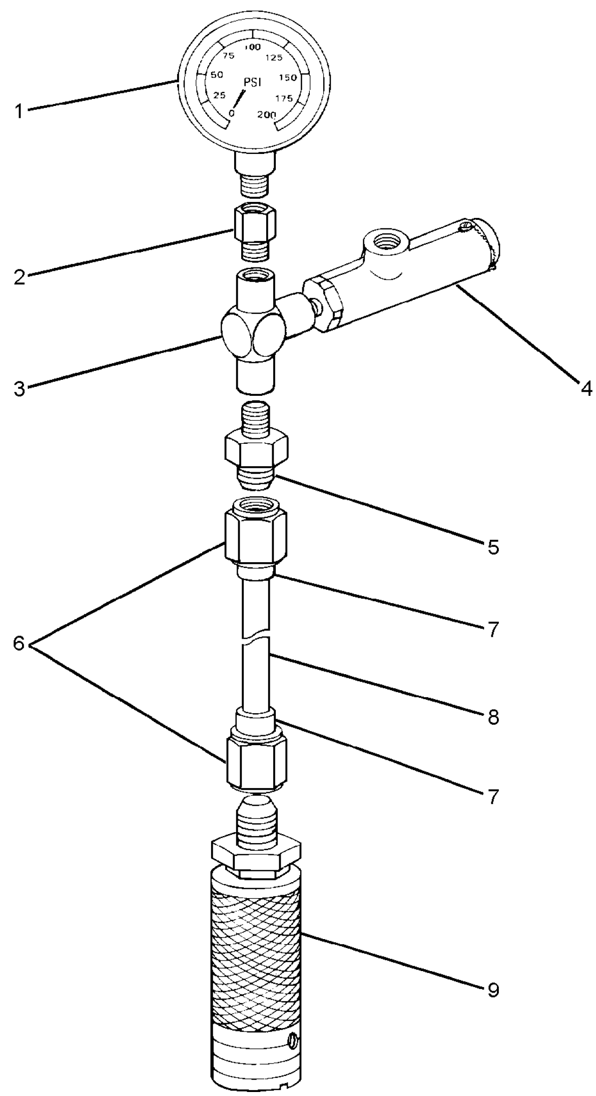


Figure 8-5. Critically Overpressurized Bendix LOX Converter, P/N 3263004-0201



ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY INSTRUCTIONS
1	200 PSIG Oxygen Gage	P/N 100204-18 (CAGE 42527) NIIN 00-961-1990	Anti-seize tape required (Note 1)
2	1/4 to 1/8 in. Reducer, Pipe	P/N 3200X4X2 (CAGE 79470)	Anti-seize tape required
3	Pipe Tee	AN917-1	—
4	Relief Valve	P/N 20C-0005-20 (CAGE 19062) MIL-V-9050D P/N 20C-0050-2	Adjust to relieve at 135 ±5 psig and flow a minimum of 100 lpm. (Note 1) Anti-seize tape required
5	Male Connector	AN816-5D	Anti-seize tape required
6	Tubenut	AN818-5	2 required
7	Tube Sleeve	MS20819-5	2 required
8	Flared Aluminum 6061-T6 Tube (5/16″ O.D. Dia)	—	Cut length 2 1/2 to 3 1/2 in.
9	Supply Quick-disconnect Coupling	MS22608-7 P/N 199000-1 (CAGE 83533)	—

Notes: 1. The Pressure Gage/Relief Valve Test Fixture shall be forwarded to AIMD for relief valve setting, flow test, and leakage test (same as converter relief valve test only higher setting). The 200 PSI Oxygen Gage shall be calibrated in accordance with the metrology and calibration (METCAL) program.

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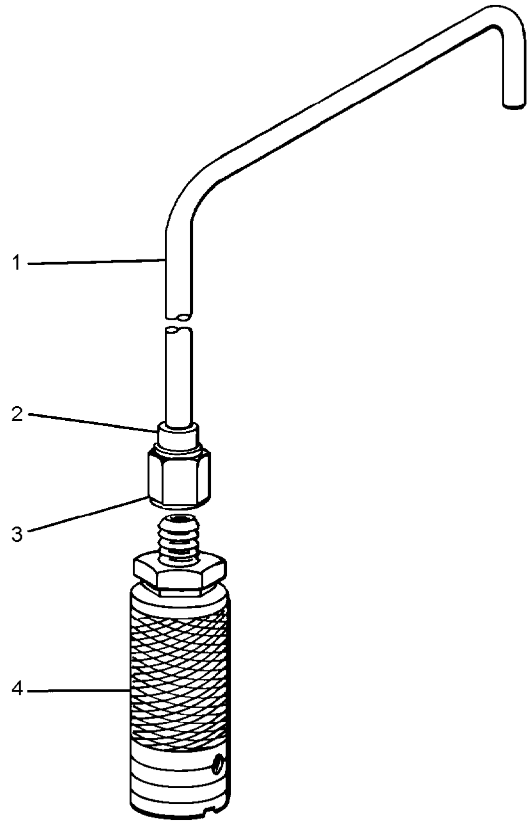
Figure 8-6. Pressure Gage/Relief Valve Test Fixture



ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY INSTRUCTIONS
1	Flared Aluminum 6061-T6 Tube (1/2 O.D. Dia)	—	Cut to 14-inches; bend as shown above
2	Tube Sleeve Coupling	MS20819-8	—
3	Tubenut	AN818-8	—
4	Half Coupling Quick-disconnect	2560000-1 (CAGE 83533)	—

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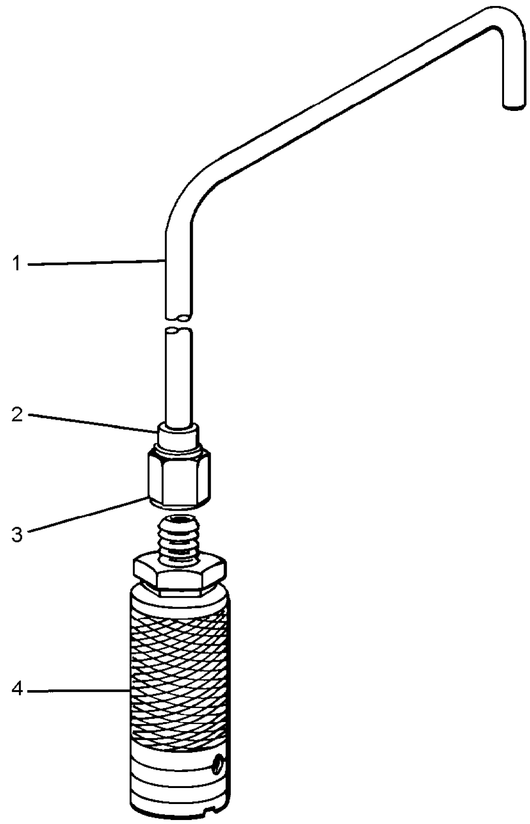
Figure 8-7. Vent Port Drain Line



ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY INSTRUCTIONS
1	Flared Aluminum 6061-T6 Tube (5/16″ O.D. Dia)	—	Cut to 14-inch length; bend as desired
2	Tube Sleeve	MS20819-8	—
3	Tubenut	AN818-5	—
4	Quick-disconnect Coupling	MS22068-7 P/N 199000-1 (CAGE 83533)	—

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Figure 8-8. LOX Converter Drain Line

Table 8-2. Troubleshooting (Acceptance/Turnaround/Daily/Preflight/ Postflight and Transfer Inspections)

Trouble	Probable Cause	Remedy
Converter will not fill.	Ice in filler valve or filler obstructs LOX flow.	Thaw filler valve or filler line.
Converter does not fill in required time.	Filler line not properly purged prior to filling.	Purge and cool filler line.
	Converter not sub-cooled before filling.	Lower pressure in servicing trailer and sub-cool converter.
	Filling pressure too low.	Set fill pressure in accordance with servicing trailer operating instructions.
	Defective converter.	Replace converter with RFI converter.
Frost collects on entire outer jacket of converter.	Heat loss due to annular space leakage.	Replace converter with RFI converter.
Converter will fill only partially (gas only emitted from vent).	Converter not sub-cooled prior to filling.	Lower pressure in servicing trailer and sub-cool converter.
System will not build up.	Combination valve defective or partially open.	Replace converter, or thaw valve.
	Pressure relief valve open.	Replace converter with RFI converter.
Oxygen supply consumed too quickly.	Converter not completely filled during filling operation.	Refill converter.
	System leakage.	Locate and repair leaks.
	Combination valve partially open, venting gas.	Replace converter with RFI converter.
Filler line cannot be disconnected from filler valve.	Filler nozzle frozen to filler valve.	Thaw nozzle.
Low, or no system pressure.	System leakage.	Locate and repair leaks.
	Pressure closing valve out of adjustment.	Replace converter with RFI converter.
Quantity gage indicates empty.	System empty; defective probes or gage.	Refill converter; replace converter or gage.
LOX system contaminated.	Undesirable odors, or moisture.	Purge system.

NOTE

Charge the converter in accordance with paragraph 8-53; ensuring strict compliance with all steps, especially steps 5 and 6.

8-31. Any liquid oxygen converter which does not pass the visual inspection or functional test shall be removed from the aircraft, drained immediately, and replaced by a Ready For Issue (RFI) liquid oxygen converter. To drain the liquid oxygen converter, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Line, Drain, Converter, LOX	Fabricate IAW figure 8-8

NOTE

If no LOX converter drain line is available, fabricate one in accordance with figure 8-8.

1. Place converter in LOX drain pan in an area free from dirt and hydrocarbons.

WARNING

Ensure that draining LOX is directed away from all personnel.

2. Attach drain line to converter supply quick-disconnect coupling, which will immediately begin draining the converter.

3. Notify Maintenance Control for action to be taken.

8-32. Visual Inspection. Visually inspect the converter assembly and surrounding area for the following:

WARNING

When working with oxygen, make certain that clothing, tubing fittings, and equipment are free of oil, grease, fuel, hydraulic fluid, or any other combustible material. Fire or explosion can result when even slight traces of combustible material come in contact with oxygen under pressure.

1. Freedom from dirt and hydrocarbons.

2. Correct installation and positioning of all components.

3. Legibility of all markings.

4. Cracks, dents, or other damage to tubing, valves, and electrical connections.

5. Corrosion on converter assembly and surrounding areas.

6. Obstructions in aircraft overboard vent line.

7. Security of supply, vent, and electrical quick-disconnects.

8. Excessive frosting and/or constant venting of converter assembly.

9. Current date (within last 231 days) on converter bench test decal.

8-33. Functional Test. To functionally test the converter assembly and aircraft oxygen system, proceed as follows:

NOTE

The Functional Test should also be performed whenever a component of the aircraft oxygen system is removed/replaced.

1. Ensure all fuses associated with the LOX quantity indicating system are operational.

NOTE

Refer to applicable aircraft Handbook of Maintenance Instructions (HMI) to determine at what quantity (indicated on quantity gage) low warning light should illuminate.

2. Ensure electrical power is on. Check quantity gage and low warning light for proper operation.

3. Ensure oxygen shutoff valve is in the OFF position.

4. Attach an oxygen mask, regulator, and regulator-to-seat kit hose assembly to oxygen supply connection in aircraft.

5. Turn oxygen shutoff valve to the ON position. Ensure regulator is in the 100% oxygen position. There should be a flow of oxygen through the mask.

NOTE

Resistance during exhalation is due to the positive pressure feature of the regulator.

6. Place mask against face and breathe. There should be a slight resistance during exhalation.

7. Upon completion of Functional Test, turn oxygen shutoff valve to OFF. Disconnect regulator-to-seat kit hose from aircraft supply connection.

8-34. If discrepancies are found or suspected, Maintenance Control shall be notified.

8-35. Components of the aircraft oxygen system which do not pass inspection and cannot be repaired in the aircraft shall be removed and replaced by Ready For Issue (RFI) components. Forward defective components to AIMD for Bench Test.

8-36. CALENDAR INSPECTION. The Calendar Inspection shall be performed on all liquid oxygen converters that incorporate a quick-disconnect mounting plate prior to placing in service and at intervals not exceeding 231 days thereafter. This interval applies to all converters: aircraft-installed, shop spares, and those maintained in a servicing pool.

8-37. The Calendar Inspection consists of a Visual Inspection followed by a Bench Test. All work shall be performed in a clean, dust-free and oil-free area. Converter assemblies found to be damaged or out of adjustment shall be repaired by replacing or adjusting the affected part or parts. After repair, repeat the Bench Test.

NOTE

Liquid oxygen converters new from supply, manufacture, or from NARF overhaul do not require the bench test decal. The bench test decal shall be placed on the converter by the local AIMD when the converter is placed in service and after each Bench Test.

8-38. Visual Inspection. Inspect the converter assembly in accordance with table 8-3.

8-39. Liquid oxygen converters failing the Visual Inspection or Bench Test (paragraph 8-40) shall be repaired if specific repair is authorized. SM&R codes define repairable components and levels of maintenance authorized to perform repairs. Further explanation is found in Naval Aviation Maintenance Program Manual, OPNAVINST 4790.2 Series.

8-40. BENCH TEST.

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical over-pressurization, immediately comply with the emergency pressure relief procedures given in paragraph 8-28 at the beginning of this section.

When working with oxygen, make certain that clothing, tubing fittings, and equipment are free of oil, grease, fuel, hydraulic fluid, or any other combustible material. Fire or explosion can result when even slight traces of combustible material come in contact with oxygen under pressure.

Prior to use, inspect leak detection compound. Compound which is not clear and free from suspended material/sediment is considered contaminated and shall be disposed of. Compound exhibiting peculiar odors such as acetone or alcohol is considered contaminated and shall be disposed of.

When using leak detection compound carefully avoid getting it on Probe Wire connections as moisture will cause incorrect capacitance/insulation reading.

NOTE

Tests are arranged so that they proceed from one test to the next with a minimum of flow changes. Troubleshooting tables are provided following each test.

Some in service liquid oxygen converter test stands that bear part numbers other then those mentioned in paragraph 8-41 still exist. Use of these test stands is authorized if they are capable of monitoring converter performance as specified in the Bench Test.

Table 8-3. Visual Inspection of the Liquid Oxygen Converter, Type GCU-( )/A, P/N 3263004-0201

Part Nomenclature	Index Number	Inspect For	Remedy
Note: Index numbers in this table refer to figure 8-12.			
Identification and performance plates.	-52 and -54	Legibility, condition and security.	Secure in place or replace.
Warning and bench test decals.	-51 and -53	Presence and condition.	Replace or apply as required.
Handle.	-1	Bends and cracks.	Replace.
Tubing assemblies and manifold assembly.	-6, -33, and -46	Cracks, dents, nicks, scratches, twists, and proper clearance. Damaged connectors and tube nuts.	Replace damaged tubing assemblies and connectors. Tubing may be slightly bent to maintain a minimum 1/16-inch clearance from other converter components.
Elbows and nipples.	All.	Cracks, dents and scratches.	Replace.
Male coupling assemblies.	-34 and -40	Visible damage.	Replace.
Shock mounts and cup-shock pads.	-29, -30, and -32	Security and condition.	Replace.
Combination valve.	-35	Cracks, damaged poppet valve or nosepiece, or worn helical grooves.	Replace.
Clamps.	-47	Security and condition.	Tighten or replace.
Pressure closing valve.	-44	Cracks or other visible damage.	Replace.
Mounting pad assembly.	-50	Cracks, broken welds, or other visible damage.	Replace damaged components.
Container assembly.	-9	Excessive dents, chipped paint, or other damage.	Refer to paragraph 8-64 for size of acceptable dents. Restore finish by painting (paragraph 8-64).
Converter assembly.	No Index.	Freedom from dirt, hydrocarbons, and corrosion.	Clean (paragraph 8-60) and/or refinish (paragraph 8-64).

8-41. The Bench Test shall be performed using Liquid Oxygen Converter Test Stand P/Ns 59A120, 31TB19951, 1455AS100-1, or 31TB1995-4. Refer to appropriate ground support equipment manual for identification of test stand controls and indicators referenced in Bench Test procedures. Do not attempt to perform any Bench Test without first becoming thoroughly familiar with the test stand (refer to appropriate ground support equipment manual). Utilize Performance Test Sheet (figure 8-4) when performing Bench Test.

8-42. TARE WEIGHT. To find the Tare Weight of the complete converter assembly, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

NOTE

Tare Weight is the weight of the complete converter assembly less the weight of the LOX.

1. Ensure that all LOX has been removed from converter.

2. Place converter assembly on scale of at least 50-lb capacity. Record weight in space provided on Performance Test Sheet.

8-43. CONVERTER ASSEMBLY PURGE. To purge the converter assembly, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Nitrogen, Oil-free, Water Pumped, Type I, Class I, Grade B	Fed Spec BB-N-411 NIIN 00-985-7275

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
2 ea	Cap Assembly	AN929-5
1	Coupling, Quick-disconnect, Half	256000-1 MS22068-8 (CAGE 83533)
1	Expander, Thread, Screw, Bushing	AN894-8-4
1	Line, Drain, Converter, LOX	Fabricate IAW figure 8-8
1	Purging Unit, Gas/LOX, Model A/M26M-3	3447AS100-1

WARNING

Use only oil-free nitrogen for purging LOX converters.

Purging unit model A/M26M-3 has two specially designed 3500 psig nitrogen cylinders. Do not substitute these cylinders with other nitrogen cylinders such as NAN cart cylinders.

While operating purging unit model A/M26M-3, protective gloves must be worn by operator. Discharge fittings and hoses can reach temperatures that will cause burns if grasped with bare hands.

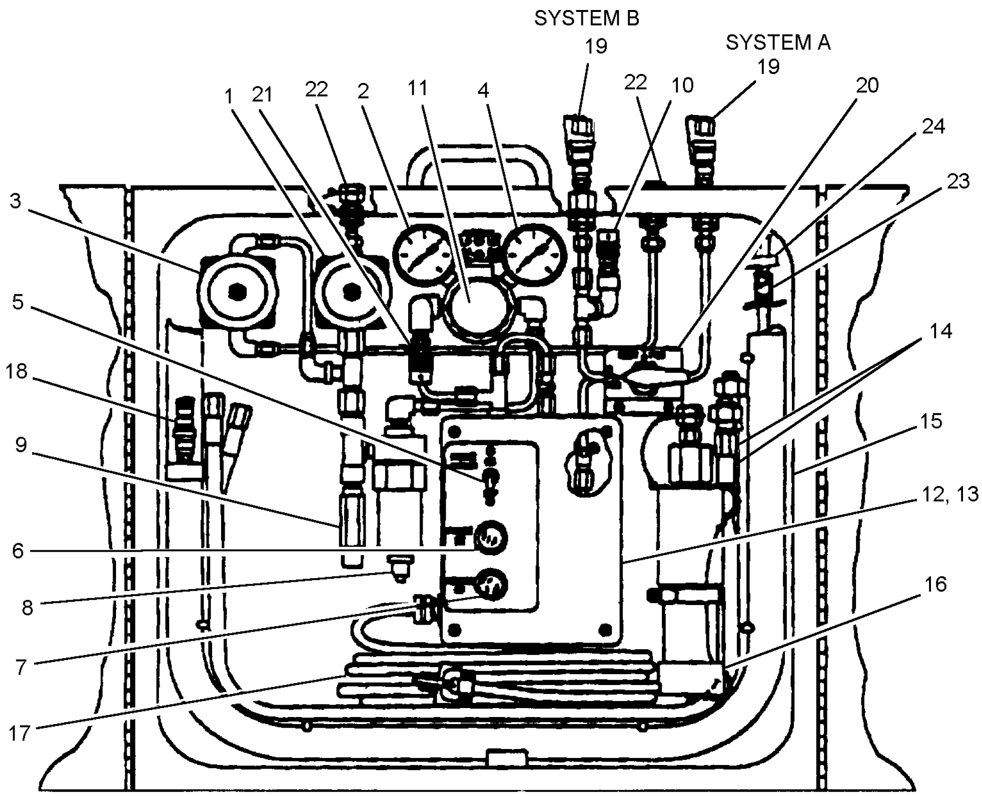
NOTE

Personnel operating purging unit model A/M26M-3 should be thoroughly familiar with all valves and controls prior to operating. Refer to appropriate support equipment manual. Personnel operating purging unit model A/M26M-3 shall be licensed in accordance with OPNAVINST 4790.2 series.

Liquid oxygen converters shall be emptied of all LOX and allowed to warm to ambient temperature prior to purging.

Index numbers in parentheses for LOX converter assembly, refer to figure 8-12.

Index numbers for purging unit model A/M26M-3, refer to figure 8-9.



Description	Function
1. Hand Shutoff Valve	Controls Supply Gas Flow
2. Low Pressure Gage	Indicates Delivery Gas Pressure (0-200 PSIG)
3. Hand Shutoff Valve	Controls Supply Gas Flow
4. High Pressure Gage	Indicates Supply Gas Pressure (0-4000 PSIG)
5. Power Switch	Master On/Off Switch/Circuit Breaker
6. Power On Light	Indicates Master Switch is On and Set is Operational
7. Heater On Light	Indicates Operation of Heater
8. Priority Valve	Stops Gas Flow When Supply Gas Pressure Falls Below 200 PSIG
9. Relief Valve	Relieves Supply Pressure Exceeding 3750 PSIG
10. Low Pressure Relief Valve	Relieves Service Line Supply Pressure Exceeding 705 PSIG
11. Pressure Regulator Assembly	Regulates Pressure to 0-200 PSIG
12. Temperature Control Switch (Under Plate)	Cycles Off and On to Control Exit Gas
13. High Temperature Shutdown (Under Plate)	Shuts Off Heater when Heater Block Temperature Reaches 285°F
14. Supply Line	Connects Supply Cylinders to Housing Assembly
15. Insulated Hose Assembly	Connects Housing Assembly
16. Filler Valve	Connects Insulated Hose Assembly to Converter
17. Power Cable	Connects Unit to Electrical Power
18. Quick Disconnect	Connects Insulated Hose to 19 System A or B
19. Quick Disconnect	Connection for Insulated Hose to 19 System A or B
20. 3-Way Valve	Selects A or B Outlet Ports
21. High Pressure Relief Valve	Relieves Service Line Supply Pressure Exceeding 1355 PSIG
22. Supply Pressure Inlet	Connects Supply Line 14 to Purge Unit
23. B-Nut	Connects Insulated Hose to Filler Valve 16 or Adapter (Not Shown)
24. Adapter	Connects Insulated Hose to P-3 Aircraft Filler Port

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Figure 8-9. A/M26M-3 Purging Unit

1. Remove two supply lines (14) from purge unit cabinet. Connect one end of each supply line (14) to nitrogen supply cylinders and the other ends to the supply inlet connections (22) of purge unit.

2. Remove insulated hose (15) from purge unit cabinet. Connect quick-disconnect (18) of insulated hose (15) to system (A) quick-disconnect (19) of purge unit.

3. Screw boss to pipe fitting onto quick-disconnect coupling and attach to B-nut (23) of insulated hose (15).

4. Turn purge unit 3-way valve (20) to system (A) position.

5. Ensure power switch (5) is OFF.

6. Remove power cable (17) from purge unit cabinet and plug into 110 volt outlet.

7. Open both nitrogen supply cylinder valves.

8. Open hand shutoff valves (1) and (3). High pressure gage (4) will indicate nitrogen supply cylinder pressure.

9. Connect quick-disconnect coupling, attached to insulated hose (15), to LOX converter vent port of fill, build up, and vent valve (43).

10. Attach adapter to fill port of LOX converter fill, build up, and vent valve (43). Turn knurl knob of adapter clockwise until it seats, then back off counterclockwise two (2) full turns. This will place the fill, build up, and vent valve half way between the fill/vent and build up/vent modes.

11. Attach LOX converter drain lines (figure 8-8) to LOX converter supply quick-disconnect coupling (16).

12. Turn power switch (5) to ON position. Power on light (6) should illuminate.

13. Turn pressure regulator (11) clockwise until 120 psig is indicated on low pressure gage (2).

NOTE

For LOX converters that show indications of internal probe short, it may be necessary to purge the converter for a longer period of time when performing step 14.

14. Observe heater on light (7). When light cycles from on to off, purge the converter for 30 minutes, with a minimum discharge temperature of 90°F.

15. When purging is completed, turn purging unit power switch (5) to off.

16. Close nitrogen supply cylinder valves.

17. Observe low pressure gage (2) and high pressure gage (4) until they indicate 0 psig. Back out counterclockwise on pressure regulator (11).

18. Close hand shutoff valves (1) and (3).

19. Disconnect insulated hose (15) from LOX converter vent port fitting of fill, build up, and vent valve (43) and purging unit system (A) quick-disconnect (19).

20. Remove drain lines (figure 8-8) from LOX converter supply quick-disconnect coupling (16).

21. Remove adapter from filler port of fill, build up, and vent valve (43).

22. Stow all lines and accessories and secure from purging.

8-44. INSULATION RESISTANCE TEST (EMPTY). To perform the Insulation Resistance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Prior to proceeding, it should be noted that the minimum acceptable megohm readings have been changed as follows: between A to B, 2.0 megohms; between A to ground and B to ground, 1.0 megohm. These readings are acceptable as long as the converter passes the Capacitance Test (Empty) and Capacitance Test (Full).

1. Secure empty converter in rack provided on test stand counter top.

2. Using test stand cable assembly, connect converter probe assembly electrical connectors (16 and 17) to terminals marked A and B of liquid oxygen quantity gage capacitance type tester.

3. Turn power switch ON and allow tester to warm up 10 minutes prior to proceeding.

4. Turn MEGOHMMETER RANGE SELECTOR to X-1 position.

5. Turn FUNCTION SELECTOR knob to A to B position. Record reading in space provided on Performance Test Sheet. Reading should not be less than 2.0 megohms.

6. Turn FUNCTION SELECTOR knob to A to GROUND and B to GROUND positions, respectively. Record readings in spaces provided on Performance Test Sheet. Readings shall not be less than 1.0 megohm in either position.

NOTE

If insulation resistance readings are within the minimum acceptable megohm requirements, proceed to Capacitance Test (Empty).

NOTE

If insulation resistance readings are less than the minimum acceptable megohm requirements, moisture may still be present in container assembly. Proceed to step 7.

7. Purge converter in accordance with paragraph 8-43 and repeat Insulation Resistance Test (Empty).

NOTE

Converter assemblies that fail the Insulation Resistance Test and cannot be corrected by purging shall be forwarded to the next higher maintenance repair facility.

8. Leave all connections unchanged.

8-45. CAPACITANCE TEST (EMPTY). To perform the Capacitance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Turn CAPACITANCE RANGE SELECTOR knob to X-10 position.

2. Turn FUNCTION SELECTOR knob to CAPACITANCE (UUF) position.

3. Record reading in space provided on Performance Test Sheet. Reading shall be 62.5 to micromicrofarads ($\mu\mu$F).

NOTE

If reading is acceptable, proceed to step 5. If reading is not within 63.0 to 64.0 micromicrofarads, moisture may still be present within the container assembly. Proceed to step 4.

4. Purge converter in accordance with paragraph 8-43, and repeat Capacitance Test (Empty).

NOTE

Converter assemblies that fail the Capacitance Test and cannot be corrected by purging shall be forwarded to the next higher maintenance repair facility.

5. Secure power to tester and disconnect test stand cable assembly from converter and test stand.

8-46. CONVERTER LEAKAGE TEST. To perform the Converter Leakage Test, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	Fitting, Tee	MS20825-5D
1	Hose Assembly, Stand, Test	59A120-B5-14
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Index numbers in parentheses refer to figure 8-12.

Converters which have been previously bench tested using these procedures have a tee fitting and cap assembly installed in place of the elbow (7). If so, proceed to step 3.

1. Disconnect tube nut of manifold assembly (46) attached to elbow (7). Remove elbow (7) and install a tee fitting into elbow (8).

2. Connect tube nut of manifold assembly (46) to tee fitting installed in step 1.

3. Using test stand hose assembly connect test stand BELL JAR BOTTOM COUPLING (C-1) to tee fitting.

4. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

5. Slowly opening OXYGEN SUPPLY valve (V-6) apply 95 psig, as indicated on TEST PRESSURE gage (PG-1) to converter.

6. Maintain 95 psig and inspect for leakage at all connections using leak detection compound. There is no allowable leakage. If leakage is indicated, locate probable cause using troubleshooting table (table 8-4).

7. Close OXYGEN SUPPLY valve (V-6). Bleed test stand using SYSTEM BLEED valve (V-5). Close TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

8-47. RELIEF VALVE TEST. To perform the Relief Valve Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cap, Tube	AN929-5
1	Hose Assembly, Stand, Test	59A120-B5-14
1	Hose Assembly, Stand, Test	59A120-B5-52
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

Table 8-4. Troubleshooting (Converter Leakage Test)

Trouble	Probable Cause	Remedy
Any fitting connection leaking.	Loose connection.	Tighten connection.
Elbow or nipple fitting leaking.	Stripped threads, excessive burrs, deep scratches, inside or outside diameter out of round or loose.	Tighten or replace fitting(s).
Tubing leaking.	Dents, kinks, deep scratches, twisted tubing, improperly flared ends, or damaged connectors.	Replace tubing.

NOTE

Index numbers in parentheses refer to figure 8-12.

1. Ensure that test stand hose assembly (P/N 59A120-B5-14), connecting BELL JAR BOTTOM COUPLING (C-1) to tee fitting, is in place.

2. Using test stand hose assembly (P/N 59A120-B5-52), connect converter vent coupling assembly to test stand FLOWMETER connection (NIP-4).

3. Turn FLOWMETER SELECTOR valve (V-1) to the 0-150 lpm position. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly, and observe TEST PRESSURE gage (PG-1), and FLOWMETER INDICATOR gage (PG-2) when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

4. Slowly open OXYGEN SUPPLY valve (V-6) until 100 lpm flow is indicated on FLOWMETER INDICATOR gage (PG-2).

5. With a 100 lpm indicated on FLOWMETER INDICATOR gage (PG-2), reading on TEST PRESSURE gage (PG-1) shall be 100 to 120 psig. Record reading from TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2) on Performance Test Sheet.

6. Using OXYGEN SUPPLY valve (V-6) and SYSTEM BLEED valve (V-5), reduce pressure applied to converter to 95 psig as indicated on TEST PRESSURE gage PG-1.

7. Disconnect test stand hose (P/N 59A120-B5-52) from FLOWMETER connection (NIP-4).

CAUTION

When attaching test stand hose (P/N 59A120-B5-52) to FLOWMETER connection (NIP-1) attach slowly while observing FLOWMETER INDICATOR gage (PG-2). Excessive relief valve leakage could damage FLOWMETER INDICATOR gage (PG-2).

8. Turn FLOWMETER SELECTOR valve (V-1) to the 0.0-0.25 position and slowly connect test stand hose (P/N 59A120-B5-52) to FLOWMETER connection (NIP-1).

9. While maintaining 95 psig to the converter with OXYGEN SUPPLY valve (V-6), check for leakage indicated on FLOWMETER INDICATOR gage (PG-2). Maximum allowable leakage is 0.01 lpm. Record reading on Performance Test Sheet.

10. If leakage is excessive or if relief valve fails to vent at required flow and pressure, locate probable cause using troubleshooting table (table 8-5).

Table 8-5. Troubleshooting (Relief Valve Test)

Trouble	Probable Cause	Remedy
Relieving below 100 psig.	Relief valve out of adjustment.	Adjust relief valve (refer to paragraph 8-70, step 21).
Relieving above 120 psig.	Relief valve out of adjustment.	Adjust relief valve (refer to paragraph 8-70, step 21).
Relief valve fails to vent 100 lpm.	Relief valve out of adjustment.	Adjust relief valve (refer to paragraph 8-70, step 21).
Leakage in excess of 0.01 lpm.	Relief valve out of adjustment.	Adjust relief valve (refer to paragraph 8-70, step 21).
Relief valve cannot be adjusted to tolerances.	Defective parts.	Replace defective parts.

11. Close OXYGEN SUPPLY valve (V-6). Bleed test stand using SYSTEM BLEED valve (V-5). Close TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

12. Disconnect test stand hose assemblies from converter and from test stand.

NOTE

The tee fitting which was installed in paragraph 8-46 shall be left on the converter to provide a test port for Bench Test procedures.

13. Cap tee fitting, using a tube cap.

14. Remove converter assembly from test stand.

8-48. FILL AND BUILDUP TIME TEST. To perform the Fill and Buildup Time Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Fixture, Test, Valve, Gage/Relief, Pressure	Fabricate IAW figure 8-6
1	Line, Drain, Port, Vent	Fabricate IAW figure 8-7

WARNING

Because of the extremely low temperature of LOX, use extreme care at all times when handling LOX. Ensure prescribed protective clothing is worn and all safety precautions are observed (Chapter 3).

Ensure venting LOX is directed away from all personnel in the area.

NOTE

Personnel servicing LOX converters and operating LOX transfer equipment shall be qualified and licensed in accordance with OPNAVINST 4790.2 Series.

To perform this test, it will be necessary to take the converter to a LOX servicing area or to use a LOX servicing trailer in the immediate area of the Oxygen Shop. Any other method that meets the requirements of the test and does not violate safety precautions outlined in Chapter 3 is acceptable.

1. Connect the converter to the servicing trailer.

NOTE

If servicing trailer being used is not the closed loop type, attach a vent port drain line (figure 8-7) to the vent port coupling (34). Ensure vent port drain line is attached to route, venting LOX away from all personnel.

2. Note the time, and fill the converter, following applicable instructions for specific ground support equipment servicing trailer being used.

3. When converter is full, note the time. Time required to fill the converter shall not exceed 10 minutes. Record the fill time in space provided on Performance Test Sheet.

4. Note the time and disconnect and secure the servicing trailer, (remove vent port drain line if installed). Time noted is beginning of Fill and Buildup Time Test.

NOTE

The test pressure gage relief valve test fixture shall be forwarded to the Intermediate Maintenance activity every 6 months for pressure gage calibration and relief valve adjustment and leakage test.

5. Immediately after servicing, attach pressure gage/relief valve test fixture (figure 8-6) to converter supply quick-disconnect coupling (16) and observe for 5 minutes; the following actions should occur:

a. The converter should begin to build head pressure as indicated on the pressure gage/relief valve test fixture. Initially the converter will build a pressure that will cause the LOX converter relief valve to relieve (110 to 120 psig). This action may occur twice.

WARNING

When performing step 5b, if pressure fails to stabilize, drain the LOX converter and forward to Intermediate Level maintenance.

b. After step 5a occurs, pressure indication on the pressure gage/relief valve test fixture should stabilize at LOX converter pressure closing valve setting of 55 to 90 psig (a slight fluctuation of 2 to 3 psig on the pressure gage/relief valve test fixture will be present).

6. Disconnect pressure gage/relief valve test fixture from supply quick-disconnect coupling.

7. If converter fails to build head pressure, converter relief valve fails to relieve between 110 to 120 psig, or converter fails to stabilize between 55 to 90 psig, refer to troubleshooting table (table 8-6).

8-49. CAPACITANCE TEST (FULL). To perform the Capacitance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

NOTE

This test requires simultaneous use of the 50-lb capacity scale and the quantity gage capacitance type tester incorporated in the test stand. Ensure that scale is positioned close to tester.

1. Place full converter on a scale of at least 50-lb capacity.

2. Using test stand cable assembly, connect converter probe assembly electrical connectors (16 and 17) to terminals marked A and B of liquid oxygen quantity gage capacitance type tester.

3. Turn power ON and allow tester to warm up 10 minutes before proceeding.

4. Turn CAPACITANCE RANGE SELECTOR knob to 10X position.

Table 8-6. Troubleshooting (LOX Converter After Servicing)

Trouble	Probable Cause	Remedy
Converter fails to build head pressure.	Converter fill, buildup, and vent valve failed to return to build-up and supply mode.	Foward converter to AIMD for purge or valve replacement and Bench Test. Drain converter by removing tube assembly (index number 6, figure 8-12). Place converter upside down in drain pan and allow to drain by gravity flow process.
Converter relief valve fails to relieve between 110 to 120 psig.	Converter relief valve out of adjustment or defective.	Forward converter to AIMD for relief valve adjustment or replacement and Bench Test.
Converter pressure continues to build and will not stabilize.	Converter pressure closing valve defective.	Forward converter to AIMD for pressure closing valve replacement and Bench Test.

5. Turn FUNCTION SELECTOR knob to CAPACITANCE (UUF) position.

6. Enter total weight of full converter in space provided on Performance Test Sheet.

7. Enter Tare Weight of converter in space provided on Performance Test Sheet.

NOTE

If the weight of the LOX in the converter is 24 lbs 4 oz, 24 lbs 8 oz, and etc.; the ounces must be converted to decimal.

Example

24 lb 4 oz = 24-4/16 lbs
24-4/16 lbs = 24.25 lbs

Enter 24.25 on the Performance Test Sheet.

8. Subtract Tare Weight of converter from total weight. Enter this figure on Performance Test Sheet. This is weight of LOX in converter.

9. Calculate the capacitance maximum (C-max) by multiplying the weight of the LOX (W) by 2.33, and adding 64.0 to the result (2.33(W) + 64.0 = C-max). Enter the result in the space provided on the Performance Test Sheet.

10. Calculate the capacitance minimum (C-min) by multiplying the weight of the LOX (W) by 2.25 and adding 63.0 to the result (2.25(W) + 63.0 = C-min). Enter the result in space provided on Performance Test Sheet.

11. Observe and record capacitance reading from test stand capacitance gage in space provided on Performance Test Sheet. Reading shall be between minimum and maximum established in steps 9 and 10.

NOTE

If capacitance reading is acceptable, proceed to step 14.

If capacitance reading is not within the calculated limits and the converter has not been purged in previous tests, moisture may be present within the container assembly. Proceed to steps 12 and 13.

12. Purge converter in accordance with paragraph 8-43.

13. Fill converter with LOX, and repeat Capacitance Test (Full).

NOTE

If capacitance reading is still not within the calculated limits, the converter shall be forwarded to the next higher maintenance repair facility.

14. Secure tester, and disconnect cable from converter and tester. If converter passes Capacitance Test proceed to flow test, paragraph 8-50.

8-50. FLOW TEST. To perform the Flow Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Hose Assembly, Stand, Test	59A120-B5-12
1	Hose Assembly, Stand, Test	59A120-B51
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Secure converter in rack provided on test stand counter top.

2. Close TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

3. Using test stand hose assembly (P/N 59A120-B5-12), interconnect test stand FLOWMETER connection (NIP-4) to CONVERTER SUPPLY OUTLET connection (NIP-5).

4. Using test stand hose assembly (P/N 59A120-B51), connect test stand SUPPLY-TO-CONVERTER connection (NIP-6) to converter supply quick-disconnect coupling (40).

NOTE

If TEST PRESSURE gage (PG-1) reads above 90 psig, attach fill vent adapter to the fill, buildup, and vent valve. Vent converter system pressure to 70 psig by turning knurled knob clockwise.

5. Place test stand FLOWMETER SELECTOR valve (V-1) in the 0-150 lpm position. Open TEST PRESSURE gage BUILD-UP AND FLOW valve (V-10).

CAUTION

Open CONVERTER SUPPLY FLOW CONTROL valve (V-9) slowly. Because of the buildup of pressure within the converter, damage to test stand gages could result from a rapid surge of pressure.

6. Slowly open CONVERTER SUPPLY FLOW CONTROL valve (V-9) and observe FLOWMETER INDICATOR gage (PG-2). Allow flow to the converter for 5 minutes.

7. Using CONVERTER SUPPLY FLOW CONTROL valve (V-9) maintain a 120 lpm flow. The converter shall maintain pressure of 55 to 90 psig as indicated on test pressure gage (PG-1). Record pressure in space provided on Performance Test Sheet.

8. If converter supply pressure is not within limits, locate probable cause using troubleshooting table (table 8-7).

9. Remove the converter from test stand and allow it to remain undisturbed for 1 hour.

8-51. EVAPORATION LOSS TEST (BUILDUP AND SUPPLY MODE). To perform the Evaporation Loss Test in the buildup and supply mode, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

1. Gently place converter on scale and record time and converter weight on Performance Test Sheet.

2. Place converter assembly aside and allow it to remain undisturbed for 24 hours.

3. Carefully place converter on scale and record time and weight in spaces provided on Performance Test Sheet. Weight loss in 24 hours shall not exceed 3.0 lbs.

4. If weight loss is 3.0 lbs or less, and there is no excessive frosting of the sphere assembly, drain LOX from converter and proceed to converter charge paragraph. If weight loss is in excess of 3.0 lbs or if there is sphere assembly frosting, consult troubleshooting table (table 8-8), then proceed to paragraph 8-52.

8-52. EVAPORATION LOSS TEST (VENTED MODE). To perform the Evaporation Loss Test in the vented mode, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

Table 8-7. Troubleshooting (Flow Test)

Trouble	Probable Cause	Remedy
Converter fails to maintain operating pressure.	Pressure closing valve out of adjustment.	Adjust (paragraph 8-72, step 17).
	Pressure closing valve damaged.	Rebuild or replace.

Table 8-8. Troubleshooting (Evaporation Loss Test, Buildup and Supply Mode)

Trouble	Probable Cause	Remedy
Excessive weight loss.	Loss of vacuum in container assembly.	BCM converter assembly.
Excessive weight loss (evaporation loss test (buildup and supply mode)).	Excessively leaking valves, tubing, and/or fittings.	Replace valves. Tighten or replace fittings. Repeat converter leakage test (paragraph 8-46).
	Pressure closing valve out of adjustment or defective.	Adjust pressure closing valve in accordance with paragraph 8-72, step 17. Replace pressure closing valve.
Excessive frosting of container assembly.	Loss of vacuum in container.	BCM converter assembly.

NOTE

This test is required only if converter fails Evaporation Loss Test in buildup and supply mode. By comparing the weight loss of this test to that recorded during the buildup and supply Evaporation Loss Test, it is possible to determine whether sphere assembly degradation, vacuum loss, fitting leakage, or valve malfunction was responsible for converter failure during the buildup and supply Evaporation Loss Test.

1. With converter still on scale, attach test stand fill valve adapter to combination valve on converter.

WARNING

Venting a converter that is in a buildup and supply mode causes a blast of LOX from the vent port (figure 8-12, item 34). Ensure that vent blast is directed away from all personnel, and that adequate clothing and facial protection are worn.

2. Turn knurled knob of adapter clockwise until it seats. This will place converter in vented mode.

3. After converter stabilizes, record time and weight in spaces provided on Performance Test Sheet.

4. Place converter aside and allow it to remain undisturbed in vented mode for 24 hours.

5. At end of 24-hour period, carefully place converter on scale.

6. Record time and weight in spaces provided on Performance Test Sheet. Weight loss in 24 hours shall not exceed 5.0 lbs.

NOTE

A converter that loses 5.0 lbs or less in the vented mode and the weight loss is more than in the buildup and supply mode (example A) shall be considered an acceptable unit. If the weight loss is more than 5.0 lbs (example B) or if the weight loss is less than it was in the buildup and supply mode (example C) locate probable cause using troubleshooting table (table 8-9).

Example A:
Weight loss
buildup and supply mode = 3.5 lbs.
Weight loss vented mode = 4.0 lbs.
Converter is RFI.

Example B:
Weight loss
buildup and supply mode = 4.0 lbs.
Weight loss vented mode = 6.0 lbs.
Locate probable cause
using troubleshooting chart.

Example C:
Weight loss
buildup and supply mode = 4.0 lbs.
Weight loss vented mode = 3.0 lbs.
Locate probable cause
using troubleshooting chart.

Table 8-9. Troubleshooting (Evaporation Loss Test, Vented Mode)

Trouble	Probable Cause	Remedy
Excessive weight loss evaporation loss test (vented).	Loss of vacuum in container assembly.	BCM converter assembly.
Weight loss in vented mode is less than in the buildup and supply mode.	Excessively leaking valves, tubing, and/or fittings when unit failed buildup and supply mode evaporation loss test.	Replace valves. Tighten or replace fittings. Repeat converter leakage test (paragraph 8-46).
	Pressure closing valve out of adjustment or defective when unit failed buildup and supply mode evaporation loss test.	Adjust pressure closing valve in accordance with paragraph 8-72, step 17.
		Replace pressure control valve.
Excessive frosting of container assembly.	Loss of vacuum in container.	BCM converter assembly.

7. Remove fill valve adapter installed in step 1.

WARNING

Ensure that all personnel safety precautions are observed during converter drain.

8. Place converter in a LOX drain pan and drain converter completely of all LOX.

8-53. CONVERTER CHARGE. To charge the converter, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Hose Assembly, Stand, Test	59A120-B5-47
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

CAUTION

Upon completion of bench test, converter shall be charged with gaseous oxygen 25 to 30 psig to prevent entry of moisture and other contaminants during shipment/storage.

NOTE

Liquid oxygen converters that fail bench test and are beyond capability of maintenance (BCM) do not require converter charge.

1. Secure converter in rack provided on test stand counter top.

2. Using test stand hose assembly, connect test stand BELL JAR BOTTOM COUPLING (C-1) to converter coupling assembly (39).

3. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

CAUTION

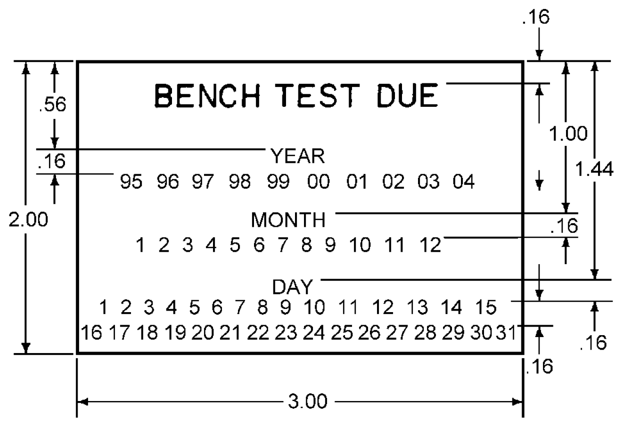
Open OXYGEN SUPPLY valve (V-6) slowly when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

4. Using OXYGEN SUPPLY VALVE (V-6), charge converter to 25 to 30 psig. Pressure will be indicated on TEST PRESSURE gage (PG-1).

5. Close OXYGEN SUPPLY valve (V-6), disconnect hose assembly connected in step 2, and bleed test stand using SYSTEM BLEED valve (V-5). Secure all test stand valves.

6. Test stand operator and CDI sign Performance Test Sheet. Retain Performance Test Sheet until next scheduled Bench Test is performed.

7. Mark due date of next Bench Test on bench test decal (figure 8-10). Due date shall be 231 days from last Bench Test date. Affix decal to converter in a position in which will be visible when converter is installed in aircraft.



NOTES:

1 MATERIAL SHALL BE ELASTOMERIC PRESSURE SENSITIVE TYPE ADHESIVE BACKED, IN ACCORDANCE WITH MIL-M-43719, TYPE I, CLASS 1.
2 ALL LETTERS AND NUMBERS SHALL APPROXIMATELY MATCH GREEN NO. 14187 OF FED. STD. NO. 595; BACKGROUND SHALL APPROXIMATELY MATCH WHITE NO. 17875 OF FED. STD. NO. 595.
3 BENCH TEST DUE SHALL BE 18-POINT GOTHIC (SANS SERIF) LETTERING. ALL OTHER NUMBERS AND LETTERS SHALL BE 10-POINT, GOTHIC (SANS SERIF).

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Figure 8-10. Bench Test Decal

8. Annotate station/ship performing Bench Test on a serviceable condition label and affix to bench test decal so as not to interfere with marked due date.

NOTE

Bench test decals may be procured from Customer Service at the nearest NARF.

9. Install dust covers or plugs in/on all open couplings prior to shipping of storage converter.

8-54. DISASSEMBLY.

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical over-pressurization, immediately comply with the emergency pressure relief procedures given in paragraph 8-28 at the beginning of this section.

8-55. LIQUID OXYGEN CONVERTER ASSEMBLY. To disassemble the liquid oxygen converter, use index numbers assigned to figure 8-12 unless otherwise noted. Disassemble the converter only as far as necessary to correct any malfunctions or damage. Disassemble the converter as follows:

CAUTION

All disassembly, inspection, repair, and assembly must be done on benches having good lighting and in an area provided with air conditioning. Walls, floor, and ceiling should have a smooth finish and should be painted with a non-chalking paint which can be kept clean and dust free. It is desirable to keep all parts for each individual LOX converter separated. Make careful note of the location, angle of fitting, and quantity of all parts. Plastic-partitioned boxes should be used to keep the parts segregated and protected from dirt and moisture. Plastic bags are also useful for storing subassemblies and component parts after cleaning and inspection until ready for assembly.

NOTE

Discard all O-rings, gaskets, seals, and teflon sealing tape removed from connections during disassembly.

No special tools are required to disassemble, adjust, or assemble this converter.

1. Remove handle (1) by removing two screws (2), two washers (3), two bushings (5), and two nuts (4).

NOTE

Converters which have been previously bench tested using the procedures in this chapter have a tee fitting and cap assembly installed in place of the elbow (7). The following disassembly procedures refer to the tee fittings and cap assembly vice elbow (7).

2. Loosen top tube nut on vent tube assembly (6) and tube nut on manifold assembly (46) connected to tee fitting on container. Remove tee fitting and cap assembly and elbow (8) from container assembly.

3. Remove container assembly (9) by removing screws (10), nuts (11), and shock mount assemblies.

NOTE

A shock mount assembly consists of two washers (31), shock mount (32), two cup-shock pads (29), and two shock mounts (30).

4. Remove vent tube assembly (6) by loosening the other tube nut on the combination valve assembly (35).

5. Remove build-up port tube (33) by loosening tube at each end.

6. Remove coupling assembly (34) from combination valve.

7. Disconnect manifold assembly (46) by loosening tube nuts from combination valve (35), pressure closing valve (44), and manifold block (42).

8. Remove combination valve (35) and valve mounting plate (39) from mounting pad assembly (50) by removing two screws (36).

9. Remove combination valve (35) from valve mounting plate (39) by removing four screws (37).

10. Remove pressure closing valve (44) by removing two screws (45).

11. Remove coupling assembly (40), and remove manifold block assembly (42) by removing two screws (43).

12. Remove manifold assembly (46) by removing screws (48) and nuts (49) which release securing clamps (47).

8-56. CONTAINER ASSEMBLY. To disassemble the container assembly, proceed as follows:

1. Disconnect cap and chain assemblies (20, 21) by removing screw (22) and nut (23).

2. Remove two nuts and two washers holding electrical connectors (16, 17) in place on bracket (24).

3. Remove connector bracket (24) and shield assembly (25) by removing screws (13), washers (14), nuts (15), and fuse clips (12).

4. Remove tube nipple (26).

8-57. COMBINATION VALVE ASSEMBLY. To disassemble the combination valve, proceed as follows:

NOTE

Index numbers in parentheses refer to figure 8-13.

1. Remove elbow (1), elbow (2), and nipple (3) from combination valve assembly.

WARNING

Buildup seat (4) is spring loaded. Use caution when removing.

2. Remove buildup seat (4), clamping spacer (6), washer (7), and preformed packing (8) from combination valve housing (45) by removing screws (5). Remove helical compression spring (9) and ball valve (11) with attached ring (10) from buildup port.

3. Using retaining ring pliers, remove ring (10) from ball valve (11).

4. Remove cap assembly (12) from combination valve housing (45) by removing screw (13) and washer (14).

5. Remove bristo setscrew (15). Using a strap wrench, remove filler head (16) and gasket (18) from combination valve housing.

6. Extract shaft (26) with preformed packing (19), ring (20), washer (21), spring (22), washer (23), sleeve (24), and ring (25) attached, from housing (45).

7. Remove preformed packing (19) from shaft (26).

8. Using retaining ring pliers, remove ring (20) and slide off washer (21), spring (22), washer (23), and

sleeve (24); then using retaining ring pliers, remove ring (25).

9. Extract expansion plug (27) from housing (45).

10. Using retaining ring pliers, remove ring (28) and extract washer (29), spring (30), check valve head (31), sleeve (32), seat (33), and O-ring (34).

11. Using a spanner wrench, remove retainer (35) from housing (45) and extract spring (38), bellows (39), gasket (40), valve (41), spring (42), screen (43), and cup (44).

NOTE

If disassembly of retainer (35) is required, note the relative position of stop screw (36) and adjusting screw (37). This will allow for a good starting point for assembly and adjustment.

12. Disassemble retainer (35), by removing stop screw (36) and adjusting screw (37).

8-58. PRESSURE CLOSING VALVE ASSEMBLY. To disassemble the pressure closing valve, proceed as follows:

NOTE

Index numbers in parentheses refer to figure 8-14.

1. Remove elbows (1) and (2) from housing (16).

2. Using retaining ring pliers, remove ring (3) and extract filter (4), spring (5), stem (6), and disc (7).

3. Cut off strap (8) and remove cover (9) and disc.

4. Using a spanner wrench, remove bellows assembly (13) and O-ring (14).

NOTE

If disassembly of bellows assembly (13) is required, note relative position of adjusting screw (11). This will provide initial adjustment used later in assembly.

5. Disassemble bellows assembly (13) by removing O-ring (14), adjusting screw (11), and spring (12).

8-59. CLEANING.

8-60. To clean the disassembled converter, proceed as follows:

Materials Required

Quantity	Description	Reference Number
1	Wash Bottle	MS36070A
As Required	Bag, Plastic	MIL-B-117
As Required	Nitrogen, Oil-free, Water Pumped, Type I, Class I, Grade B	Fed Spec BB-N-411 NIIN 00-985-7275

WARNING

Do not use oil or any material containing oil in conjunction with oxygen equipment. Even in a minute quantity, oil that comes into contact with oxygen can cause explosion or fire. Dust, lint, or fine metal particles are also dangerous.

1. Clean all metallic parts using procedures outlined in NAVAIR 13-1-6.4-1. Blow dry with oil-free nitrogen.

2. Prior to installation, wash all silicone rubber parts in distilled water and blow dry with oil-free nitrogen.

3. After cleaning, surfaces shall be examined for cleanliness. Should further contamination be found, reclean parts in accordance with step 1.

4. Seal cleaned parts in plastic bags for storage. Bag all complete assemblies that are not immediately returned to service.

8-61. INSPECTION OF DISASSEMBLED PARTS.

8-62. Inspect the disassembled converter and component parts in accordance with table 8-10 and the following special instructions:

1. Inspect all hardware items (nipples, elbows, etc) for stripped threads, burrs, nicks, distortion, rust, corrosion, or other defects.

NOTE

Due to the method of suspension of shock-mounting of the inner container, some looseness can be detected in most containers by shaking the converter vigorously. Some models employ a spring type suspension that eventually loses some tension; others have a nylon type spacer that experiences slight shrinkage. Looseness and rattles become more apparent with age. Some looseness can be detected in many new containers. Looseness or rattles are not a criterion for determining serviceability. The integrity of the container is determined by the 24-hour Evaporation Loss Test.

8-63. REPAIR.

8-64. Repair of the converter assembly is limited to replacing defective components, minor repairs (small dents, scratches, abrasions, nicks, etc.) of tubing and assembly, attachment of pinch-off-tube protective cover, and touching up painted surfaces. To make minor repairs, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Paint, Green, (Color 14187)	(Note 1)
As Required	Lacquer-Cellulose Nitrate, Gloss Color 622, Jet Black	MIL-L-7178

Materials Required (Cont)

Quantity	Description	Reference Number
As Required	Adhesive	NIIN 00-738-6429

Notes: 1. Use any available green paint, chip color 14187, approved by local Environmental Protection Agency.

1. Consider tubing assemblies with minor dents not causing flow restriction serviceable. Smooth small scratches, abrasions, and nicks with a burnishing tool or aluminum wool.

2. To avoid burnishing the same area more than once, on each burnished area paint a band of the color and size specified as follows:

a. Color bands shall cover an area not less than 2 inches nor more than 3 inches in length.

b. Green paint shall be used on aluminum tubing.

3. Condemn nicked, abraded, or scratched tubing in an area previously identified as burnished.

4. Consider container assemblies having minor dents serviceable, provided the converter passes the vented Evaporation Loss Test. Normally, dents up to 3/8-inch deep will not affect the function of the converter.

WARNING

When painting converter, ensure fittings, tubing, and valves are removed or masked prior to painting. Paint and other foreign matter associated with painting introduced into these components could create an explosion hazard when contacting oxygen.

5. On converter assemblies passing the vented Evaporation Loss Test and having dents, paint a 3/4-inch diameter dot over each dent using black lacquer.

Table 8-10. Inspection of Disassembled Parts

Part Nomenclature	Index Number	Inspect For	Remedy
Note: Index numbers in this table refer to figure 8-12.			
Identification and performance plates.	-52 and -54	Security, condition and legibility.	Secure in place or replace if damaged or illegible.
Warning and bench test decals.	-51 and -53	Presence and condition.	Apply or replace as required.
Handle.	-1	Bends and cracks.	Replace.
Tubing assemblies and manifold assembly.	-6, -33, and -46	Cracks, dents, nicks, scratches, twists or damaged connectors and tube nuts.	Replace.
Elbows and nipples.	All.	Cracks, dents, scratches and damaged threads.	Replace.
Male coupling assemblies.	-34 and -40	Visible damage.	Replace.
Shock mount assemblies.	-29, -30, and -32	Visible damage.	Replace.
Clamps.	-47	Condition.	Tighten or replace.
Mounting pad assembly.	-50	Cracks, broken welds, or other visible damage.	Replace.
Container assembly.	-9	Dents, chipped paint, or other visible damage.	Refer to paragraph 8-64 for size of acceptable dents. Restore finish by painting (paragraph 8-64).
Dust caps.	-20 and -21	Broken chain or damaged caps.	Replace.
Fuse clips.	-12	Damage.	Replace.
Note: Index numbers in this table refer to figure 8-13.			
Buildup seat.	-4	Scratches, nicks, or wear on sealing surfaces.	Replace.
Filler head.	-16	Cracks, wear, or any visible damage of sealing surfaces.	Replace.
Shaft.	-26	Bend, nicks, scratches, or wear.	Replace.
Combination valve housing.	-45	Scratches, nicks, or any visible damage to sealing surfaces.	Replace.

Table 8-10. Inspection of Disassembled Parts (Cont)

Part Nomenclature	Index Number	Inspect For	Remedy
Note: Index numbers in this table refer to figure 8-14.			
Pressure closing valve housing.	-16	Scratches, nicks, wear, or any visible damage on sealing surfaces.	Replace.
Stem.	-6	Scratches, nicks, wear, or any visible damage on sealing surfaces.	Replace.
Filter.	-4	Clogged pores or visible damage.	Clean and/or replace.

NOTE

Prior to replacing pinch-off tube protective cover, perform an Evaporation Loss Test (vented condition) in accordance with paragraph 8-52. This will ensure that the pinch-off tube was not damaged by whatever force loosened the protective cover.

6. Secure pinch-off tube protective covers back in place over the pin-off tube as follows:

a. Clean area surrounding pinch-off tube and flange area of protective cover by sanding followed by cleaning area using procedures outlined in NAVAIR 13-1-6.4-1.

b. Mix equal portions of part “A” resin and part “B” activator. Mix thoroughly following instructions provided with adhesive.

c. Apply adhesive to flange of protective cover. Place cover over pinch-off tube, pressing in place to achieve a good bond. Wipe off excess adhesive and allow cover to remain undisturbed for approximately 8 hours.

8-65. ASSEMBLY.

8-66. Assembly of the liquid oxygen converter assembly is essentially the reverse of disassembly. Tests and adjustments are required on certain subassemblies as they are assembled to the converter.

CAUTION

Use anti-seize tape (MIL-T-27730) on all male pipe thread fittings. Apply single layer of tape, overlapping ends just enough to avoid gap in tape when fitting is installed. To prevent tube blockage, ensure tape is clear of last thread.

Do not use anti-seize tape on flared or straight thread fittings.

NOTE

Using converter overhaul parts kit (P/N 160128-1) install new O-rings, gaskets, seals, and replacement parts wherever possible, depending on extent of disassembly.

8-67. ASSEMBLY OF PRESSURE CLOSING VALVE. To assemble the pressure closing valve, proceed as follows:

NOTE

Assemble the pressure closing valve using index numbers assigned to figure 8-14.

1. Assemble bellows assembly (13) by installing O-ring (14), spring (12), and adjusting screw (11). Install adjusting screw to position noted before disassembly.

2. Using a spanner wrench, install assembled bellows into pressure closing valve housing (16).

NOTE

Tiedown strap (8), cover (9), and disc (10) are not installed at this time. These parts will be installed after entire converter assembly is assembled and adjusted for correct operation.

3. Install disc (7) onto stem (6). Insert stem (6), spring (5), and filter (4) (coarse side up) into housing (16).

4. Using retaining ring pliers, install ring (3), securing parts inserted in step 3. Ensure that retaining ring is properly seated in groove provided.

5. Install elbows (1, 2) into housing (16). Position where noted before disassembly.

8-68. Delivery Pressure Verification/Leakage Test of Pressure Closing Valve. To verify delivery pressure and to leak-test the pressure closing valve following assembly, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Index numbers in parentheses refer to figure 8-14.

1. Attach gage to elbow (1).

2. Attach buildup coil port elbow (2) to BELL JAR BOTTOM COUPLING (C-1).

3. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

4. Open OXYGEN SUPPLY valve (V-6) and apply 120 psig as indicated on TEST PRESSURE gage (PG-1). Pressure gage attached to elbow (1) should read between 55 and 90 psig.

NOTE

If outlet pressure does not fall within the 55 to 90 psig limit, adjust the pressure closing valve in accordance with paragraph 8-72, step 17.

5. Ensure that 120 psig is indicated on TEST PRESSURE gage (PG-1). Hold pressure for 5 minutes. Any increase of pressure shown on gage attached to elbow (1) indicates internal leakage and cause for rejection.

6. Apply leak detection compound to elbows (1 and 2) and bellows assembly (13). No leakage is allowed. Correct any leakage prior to proceeding.

7. Close OXYGEN SUPPLY valve (V-6) and bleed test pressure using SYSTEM BLEED valve (V-5).

8. Remove pressure closing valve from test stand and remove gage installed in step 1.

9. Remove any excess leak detection compound from valve assembly and set aside.

NOTE

Pressure closing valve will be installed and adjusted in paragraph 8-72.

8-69. ASSEMBLY OF COMBINATION VALVE. To assemble the combination valve, proceed as follows:

NOTE

Assemble the combination valve using figure 8-11 and index numbers assigned to figure 8-13.

1. If required, assemble retainer (35) by installing stop screw (36) and adjusting screw (37) to positions noted prior to disassembly.

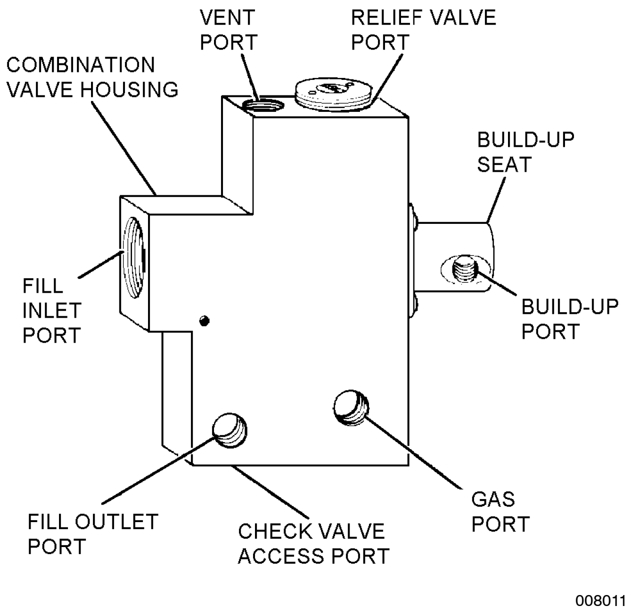


Figure 8-11. Location of Ports on Combination Valve Assembly

2. Insert filter screen (43) into spring cup (44), and carefully place cup into relief valve port with filter screen facing up.

3. Place spring (42) on valve (41), and insert unit into relief valve port with spring (42) resting in spring cup (44).

4. Place gasket (40) onto bellows (39) and insert into relief valve port.

5. Insert spring (38) into bellows (39) and install assembled retainer (35). Tighten retainer in place using a spanner wrench.

6. Place O-ring (34) onto check valve seat (33) and insert unit check valve access port of housing (45), O-ring side first.

7. Insert sleeve (32), check valve head (31) (dimple side first), spring (30), and washer (29) (collar side first) into check valve access port.

8. Using retaining ring pliers, secure inserted parts in place with ring (28). Ensure that retaining ring is properly seated in groove provided.

9. Install expansion plug (27) into check valve access port.

10. Using retaining ring pliers, install ring (10) in groove provided on ball (11) and insert unit into buildup port of housing (45).

11. Place spring (9) on ball (11).

12. Place washer (7) and preformed packing (8) onto buildup seat (4) and insert into buildup port of housing (45).

13. Secure buildup seat (4) to housing using spacer (6) and four screws (5). Position buildup seat where noted prior to disassembly.

14. Using retaining ring pliers, install ring (25) into appropriate groove on shaft (26).

15. Place plunger sleeve (24), washer (23), spring (22), and washer (21) onto shaft (26). Using retaining ring pliers, secure items with ring (20). Ensure ring is seated in groove provided.

16. Install preformed packing (19) into groove provided on shaft (26).

17. Insert assembled shaft into fill inlet port of housing (45).

18. Install filler head insert (17) into filler head (16), if required.

19. Place gasket (18) on filler head (16) and install filler head into fill inlet port. Tighten filler head with strap wrench and secure with bristo setscrew (15).

20. Attach cap assembly (12) with screw (13) and washer (14).

21. Install elbow (1), elbow (2), and nipple (3) to position noted before disassembly.

8-70. LEAKAGE TEST PORT ASSEMBLY OF COMBINATION VALVE. To perform the various leakage tests on the assembled combination valve proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
2	Capnut	AN929-5
1	Hose Assembly, Stand, Test	59A120-B5-12
1	Plug, Pipe	MS20913-C-3
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Using capnut, cap the gas port elbow.

2. Attach adapter to filler head of combination valve and turn knurled knob clockwise.

3. Attach vent port of combination valve to BELL JAR BOTTOM COUPLING (C-1). Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

4. Open OXYGEN SUPPLY valve (V-6) and apply 35 psig as indicated on TEST PRESSURE gage (PG-1).

5. Apply leak detection compound to fill port, no leakage allowed.

6. Close OXYGEN SUPPLY valve (V-6) and bleed test stand using SYSTEM BLEED valve (V-5).

7. Remove adapter from filler head of combination valve and disconnect test stand BELL JAR BOTTOM COUPLING (C-1) from vent port of combination valve.

8. Connect test stand BELL JAR BOTTOM COUPLING (C-1) to buildup port elbow (3).

9. Using pipe plug, plug vent port of combination valve.

10. Open OXYGEN SUPPLY valve (V-6) and apply 100 psig as indicated TEST PRESSURE gage (PG-1).

11. Apply leak detection compound to combination valve. No leakage is allowed.

12. Close OXYGEN SUPPLY valve (V-6) and bleed pressure from test stand using SYSTEM BLEED valve (V-5).

13. Place combination valve in the vented position by attaching adapter to filler head of combination valve and uncap gas port (1).

14. Place test stand bell jar over combination valve and secure in place.

15. Place FLOWMETER SELECTOR valve (V-1) in the 0.0-0.25 lpm position.

16. Using OXYGEN SUPPLY valve (V-6), apply 35 psig to the combination valve as indicated on TEST PRESSURE gage (PG-1).

17. Using test stand hose assembly, slowly interconnect BELL JAR TOP COUPLING (C-2) to FLOWMETER connection (NIP-1) while observing FLOWMETER INDICATOR gage (PG-2).

18. Maintain 35 psig to the combination valve for 2 minutes. Leakage on FLOWMETER INDICATOR gage (PG-2) shall not exceed 0.25 lpm.

19. Close OXYGEN SUPPLY valve (V-6) and bleed pressure from test stand using SYSTEM BLEED valve (V-5).

20. Disconnect combination valve from test stand, unplug vent port and remove adapter.

21. Test and adjust relief valve as follows:

a. Cap gas port nipple (2) with capnut.

b. Connect buildup port nipple (3) to test stand BELL JAR BOTTOM COUPLING (C-1). Install and secure bell jar.

c. Using hose assembly, interconnect BELL JAR TOP COUPLING (C-2) to FLOWMETER connection (NIP-4).

d. Turn FLOWMETER SELECTOR valve (V-1) to 0-150 lpm position.

CAUTION

Do not apply pressure above 130 psig.

When pressure is applied through OXYGEN SUPPLY valve (V-6), observe TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2). Rapid surges of pressure could damage test stand gages.

e. Open OXYGEN SUPPLY valve (V-6) slowly and apply pressure to the relief valve. Pressure will be indicated on TEST PRESSURE gage (PG-1).

f. When pressure reaches 100 to 120 psig, relief valve shall be venting a minimum 100 lpm as indicated on FLOWMETER INDICATOR gage (PG-2).

g. Disconnect test stand hose assembly from FLOWMETER connection (NIP-4) and connect it to FLOWMETER connection (NIP-1).

h. Turn FLOWMETER SELECTOR valve (V-1) to 0.0-0.25 lpm position.

i. Using test stand hose assembly, slowly interconnect BELL JAR TOP COUPLING (C-2) to FLOWMETER connection (NIP-I) while observing FLOWMETER INDICATOR gage (PG-2).

j. With 95 psig applied to the relief valve as indicated on TEST PRESSURE gage (PG-1), maximum allowable leakage, indicated on FLOWMETER INDICATOR gage (PG-2), shall be 0.01 lpm.

NOTE

If readings in steps f and i are acceptable, proceed to step n.

If readings are not acceptable, adjust relief valve in accordance with steps k thru m.

k. Remove bell jar from combination valve.

l. If valve relieves below 100 psig, turn adjusting screw (37) clockwise. If valve relieves above 120 psig, turn adjusting screw (37) counterclockwise. Turn stopscrew (36) to obtain the required flow.

NOTE

Turning stopscrew clockwise will increase flow, counterclockwise will decrease flow.

m. Place bell jar over combination valve and secure in place. Repeat steps c thru j.

NOTE

It may be necessary to repeat steps k thru m several times to obtain proper pressure and flow settings.

n. At completion of test and adjustment, close OXYGEN SUPPLY valve (V-6) and open SYSTEM BLEED valve (V-5), remove bell jar, disconnect combination valve, uncap all ports, and set valve aside, ready for installation.

8-71. ASSEMBLY OF CONTAINER. To assemble the container assembly, proceed as follows:

NOTE

Assemble the container assembly using index numbers assigned to figure 8-12.

1. Secure connection bracket (24) and fuse clips (12) with screws (13), washers (14), and nuts (15).

2. Assemble and attach electrical connectors (16, 17) to bracket (24) with respective nuts and washers.

3. Attach cap and chain assemblies (20, 21) with screw (22) and nut (23).

8-72. COMPLETION OF ASSEMBLY. To complete the assembly of the converter, proceed as follows:

CAUTION

When installing tube assemblies, ensure fittings to which tube nuts are to be attached are properly aligned with tube to prevent cross-threading. Hold connecting fittings with open end wrench to avoid straining or breakage when tightening. Hold tubing away from other components of converter assembly while tightening so that a minimum 1/16-inch clearance is maintained. It may be necessary to slightly bend some tube assemblies to maintain this clearance. Ensure tubing is not crimped after bending process.

NOTE

To complete the assembly of the converter use index numbers assigned to figure 8-12, unless otherwise noted.

1. Install coupling assembly (40) in manifold block (42).

2. Install nipple assembly (41) into manifold block (42), and attach assembled manifold block to mounting pad (50) using two screws (43).

3. Secure manifold assembly (46) to mounting pad (50) using screws (48), clamps (47), and nuts (49).

NOTE

A shock mount assembly consists of two washers (31), shock mount (31), two cup-shock pads (29), and two shock mounts (30).

4. Secure container assembly (9) to mounting pad assembly (50) using screws (10), shock mount assemblies and nuts (11).

5. Tighten screw (10) and nut (11) at each shock mount so that the distance from the top of the mounting pad to the bottom of each foot of the container assembly is 1.5 ±06 inches.

NOTE

Converters which have been previously bench tested using the procedures in this chapter have a tee fitting and cap assembly installed in place of elbow (7). The following assembly procedures will refer to the tee fitting and cap assembly.

6. Assemble elbow (8) and tee fitting onto container assembly (9).

7. Install a cap assembly to the tee fitting.

8. Mount pressure closing valve (44) to mounting pad assembly (50) with two screws (45).

9. Carefully mount combination valve (35) to valve mounting plate (39) with four screws (37).

10. Attach combination valve and valve mounting plate to mounting pad (50) with two screws (36).

11. Connect tube nuts of manifold assembly (46) to combination valve (35), pressure closing valve (44), tee fitting, and manifold block (42).

12. Attach coupling assembly (34) to combination valve (34).

13. Attach pressure closing valve to buildup port tube (33) to elbow (1) (figure 8-14) atop pressure closing valve (44) and buildup port nipple (3, figure 8-13) of combination valve (35).

14. Attach vent tube assembly (6) at container and at gas port elbow (2, figure 8-13) of combination valve.

15. Attach handle (1) with two screws (2), two washers (3), two bushings (5), and two bushings (5), and two nuts (4).

16. After completion of assembly, Bench Test the converter in accordance with paragraph 8-40.

17. During post assembly Bench Test, it may be necessary to adjust pressure closing valve (44) while performing the Flow Test (paragraph 8-50). If so, proceed as follows:

NOTE

Index numbers in parentheses refer to figure 8-14.

The 70 to 75-psig operating pressure is for adjustment purposes only. If converter maintains 55 to 90 psig, no adjustment is required. If converter pressure is above or below this range, adjust pressure closing valve to maintain 70 to 75 psig.

a. If required, remove disc (10) by cutting strap (8) and removing cover (9).

b. Using a screwdriver, turn adjusting screw (11) until a supply pressure of 70 to 75 psig is maintained with a flow of 120 lpm.

NOTE

Turn adjusting screw (11) clockwise to increase valve closing pressure and counterclockwise to decrease valve closing pressure. Flow converter at least 30 minutes to ensure pressure is constant.

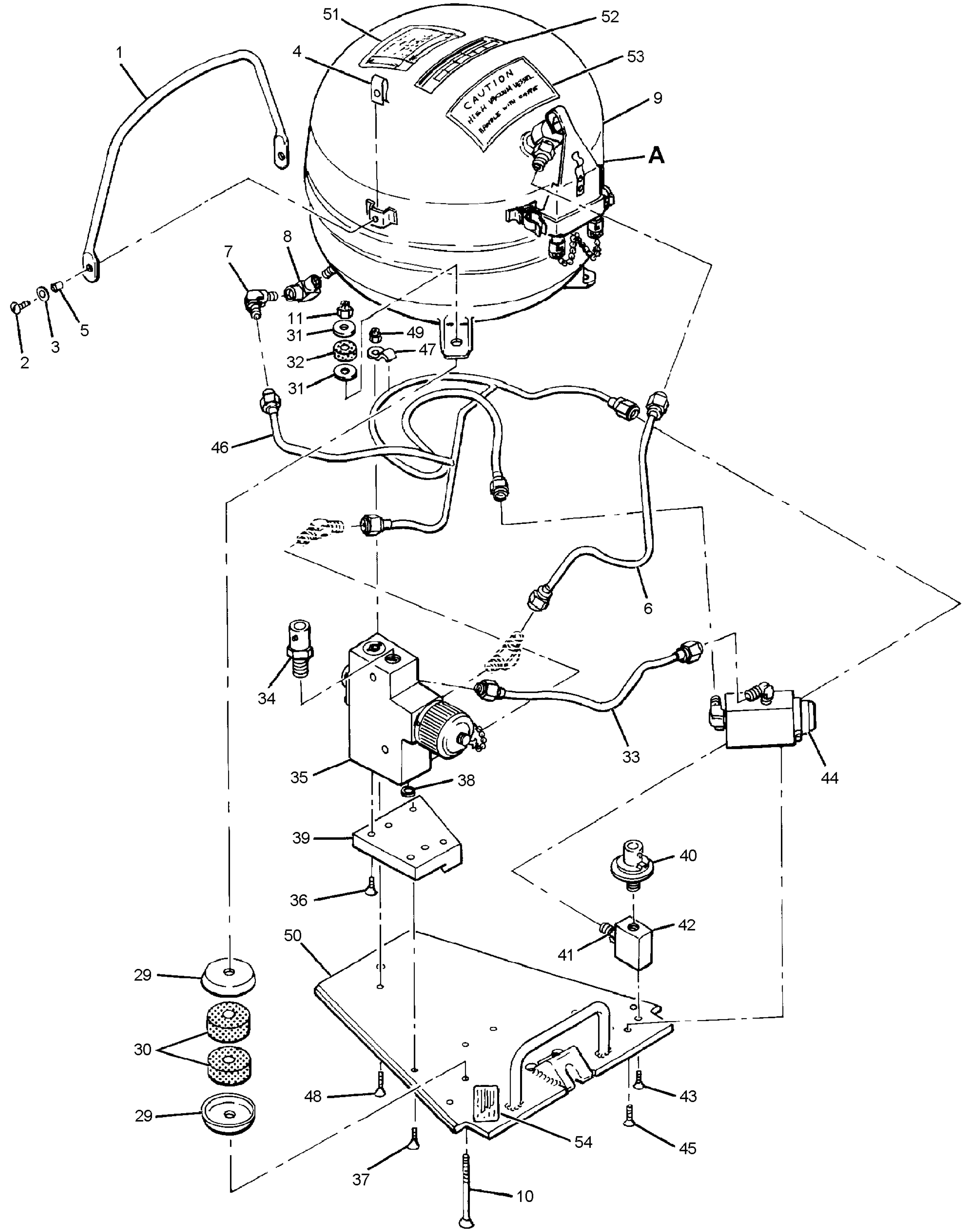
c. After correct setting of pressure closing valve is ensured, install cupped disc (10) (convex side up) and cover (9). Secure cover (9) in place using strap (8).

Section 8-5. Illustrated Parts Breakdown

8-73. GENERAL.

8-74. This section lists and illustrates the assemblies and detail parts of the Liquid Oxygen Converter Assembly, Type GCU-( )/A, P/N 3263004-0201, manufactured by Litton Life Support, formerly Bendix Corporation (CAGE 99257).

8-75. The Illustrated Parts Breakdown should be used during maintenance when requisitioning and identifying parts.



00801201

Figure 8-12. 5 Liter Liquid Oxygen Converter, Type GCU-( )/A, P/N 3263004-0201 (Sheet 1 of 2)

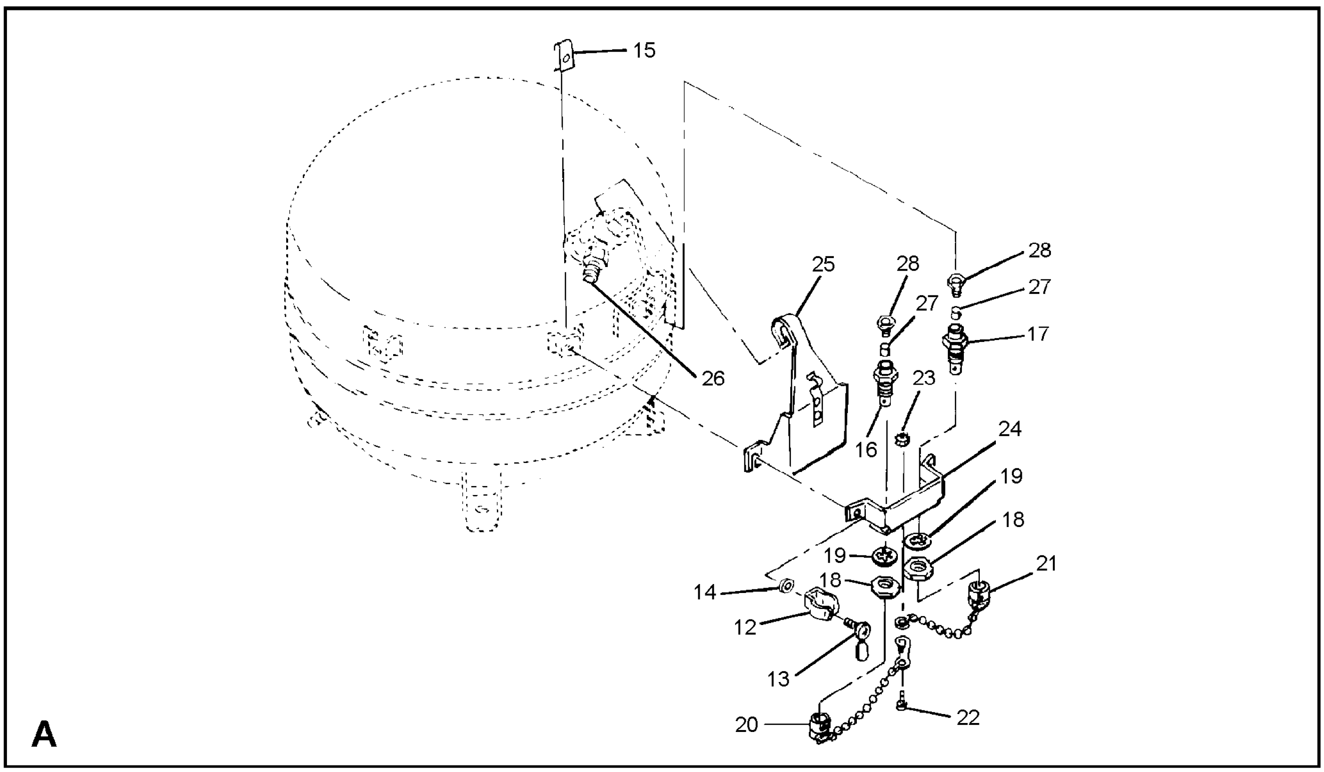


Figure 8-12. 5 Liter Liquid Oxygen Converter, Type GCU-( )/A, P/N 3263004-0201 (Sheet 2 of 2)

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
8-12	3263004-0201	CONVERTER ASSEMBLY, Liquid oxygen, 5-liter (parts kit available)	REF	
-1	1611453-1	. HANDLE	1	
		(ATTACHING PARTS)		
-2	AN525-832-6	. SCREW	2	
-3	WO-8SS	. WASHER	2	
-4	C14938SS832	. NUT, "U" Type (CAGE 78553)	2	
		---*---		
-5	1611434-1	. BUSHING	2	
-6	1627130-1	. TUBE ASSEMBLY, Vent	1	
-7	MS20822-5D	. ELBOW (Note 1)	1	
-8	AN916-1D	. ELBOW	1	
-9	3264001-0201	. CONTAINER ASSEMBLY, Liquid oxygen	1	
		(ATTACHING PARTS)		
-10	MS24694-C125	. SCREW, Machine	3	
-11	MS21045C4	. NUT, Self locking	3	
		---*---		
-12	104002	. . CLIP, Fuse (CAGE 75915)	2	
		(ATTACHING PARTS)		
-13	MS51957-43	. . SCREW, Machine	2	
-14	WO-8SS	. . WASHER	2	
-15	C14938SS832	. . NUT, "U" Type (CAGE 78553)	2	
		---*---		
-16	6690-1	. . CONNECTOR, Electrical miniature, coaxial, "B" polarity	1	
-17	6691-1	. . CONNECTOR, Electrical miniature, coaxial, "E" polarity	1	
-18	No Number	. . . NUT (Note 2)	1	
-19	No Number	. . . LOCKWASHER (Note 2)	1	
-20	1-606-1	. . CAP AND CHAIN	1	
-21	1-606-2	. . CAP AND CHAIN	1	
		(ATTACHING PARTS FOR INDEX NUMBERS 20 and 21)		
-22	RO-405SS	. . SCREW, Round head	1	
-23	NTNO-4SCP	. . STOPNUT	1	
		---*---		
-24	1627127-1	. . BRACKET, Connector	1	
-25	1627123-1	. . SHIELD ASSEMBLY, Probe wire	1	
-26	AN816-5D	. . NIPPLE, Flared Tube	1	
-27	1611421-1	. . SPACER, Connector	1	
-28	1611420-1	. . ADAPTER, Armored wire	1	
-29	1611428-2	. CUP, Shock pad	6	
-30	1622347-1	. SHOCK MOUNT	6	
-31	1627687-1	. WASHER	6	
-32	1622347-2	. SHOCK MOUNT	3	
-33	1627128-1	. TUBE ASSEMBLY, Pressure closing to buildup	1	
-34	MS22068-6	. COUPLING ASSEMBLY	1	

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
8-12-35	1620660-2	. VALVE ASSEMBLY, Combination . . . . (figure 8-13 for BKDN) (ATTACHING PARTS)	1	
-36	MS24693-C52	. SCREW, Machine	2	
-37	MS24693-C50	. SCREW, Machine . . . . ---*---	4	
-38	1602321-17	. PACKING, Preformed	1	
-39	1627124-1	. PLATE, Valve mounting	1	
-40	MS22068-4	. COUPLING ASSEMBLY	1	
-41	1627160-1	. NIPPLE ASSEMBLY	1	
-42	1627126-1	. MANIFOLD BLOCK . . . . (ATTACHING PARTS)	1	
-43	MS24693-C95	. SCREW, Machine . . . . ---*---	2	
-44	1616733-2	. VALVE ASSEMBLY, Pressure closing . . . . (figure 8-14 for BKDN) (ATTACHING PARTS)	1	
-45	MS24693-C27	. SCREW, Machine . . . . ---*---	2	
-46	1627132-1	. MANIFOLD ASSEMBLY . . . . (ATTACHING PARTS)	1	
-47	1611433-1	. CLAMP, Tube	3	
-48	MS24693-C6	. SCREW, Machine	3	
-49	MS20365-440	. NUT . . . . ---*---	3	
-50	1627133 1	. PAD ASSEMBLY, Mounting	1	
-51	CL227C2-1	. DECAL, Bench test date		
-52	1616834-1	. PLATE, Test data	1	
-53	1600482-1	. PLATE, Warning	1	
-54	1616833-1	. PLATE, Identification	1	
	1601217-1	. PARTS KIT, Converter overhaul	1	

Notes:
1. Converters which have been previously bench tested using the procedures in this chapter have a tee fitting and a cap assembly installed in place of elbow.
2. Nut and lockwasher come as part of the electrical connector and are used as attaching parts.

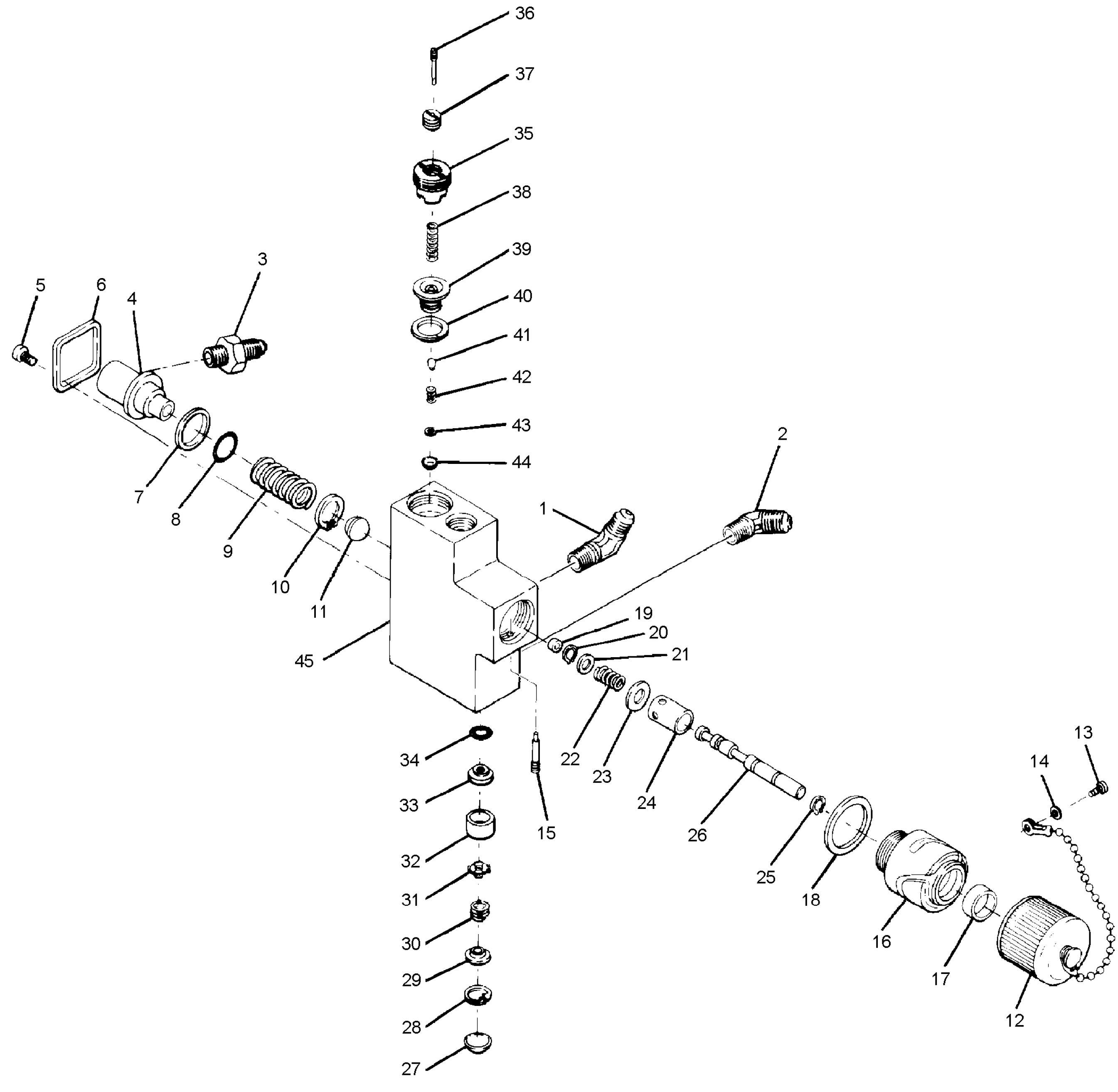


Figure 8-13. Combination Valve Assembly

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
8-13	1620660-2	VALVE ASSEMBLY, Combination . . . . (figure 8-12 for NHA)	REF	
-1	MS20822-5D	. ELBOW, 90°	1	
-2	MS20823-5D	. ELBOW, 45°	1	
-3	AN816-5D	. NIPPLE	1	
-4	1620659-1	. SEAT, Buildup	1	
		(ATTACHING PARTS)		
-5	MS51957-27	. SCREW, Machine	4	
-6	1620654-1	. SPACER, Clamping	1	
		---*---		
-7	1603661-69	. WASHER, Nonmetallic	1	
-8	1602321-35	. PACKING, Preformed	1	
-9	815404	. SPRING, Helical compression	1	
-10	MS16626-4050	. RING, Retaining	1	
-11	1620663-1	. BALL, Valve	1	
-12	MS27566-1	. CAP ASSEMBLY	1	
		(ATTACHING PARTS)		
-13	MS51957-27	. SCREW, Machine	1	
-14	AN960C6L	. WASHER	1	
		---*---		
-15	MBFS404SCP	. SETSCREW, Bristo	1	
-16	16203041	. HEAD, Filler	1	
-17	1602412-1	. INSERT, Filler head	1	
-18	1620305-1	. GASKET	1	
-19	816919-14	. PACKING, Preformed	1	
-20	MS16624-4025	. RING, Retaining	1	
-21	1603660-123	. WASHER	1	
-22	1611448-1	. SPRING, Helical compression	1	
-23	1603660-113	. WASHER	1	
-24	1611449-1	. SLEEVE, Plunger	1	
-25	MS16624-4025	. RING, Retaining	1	
-26	1620656-1	. SHAFT	1	
-27	778488-5	. PLUG, Expansion	1	
-28	MS16625-4056	. RING, Retaining	1	
-29	1600818	. WASHER, Spring guide	1	
-30	815395	. SPRING, Helical compression	1	
-31	1600820	. HEAD, Valve, check	1	
-32	1616784-1	. SLEEVE, Hold down	1	
-33	1600821	. SEAT, Valve, check	1	
-34	813752	. O-RING	1	
-35	1620550-1	. RETAINER	1	
-36	1620657-1	. SCREW, Stop	1	
-37	1620658-1	. SCREW, Adjusting	1	
-38	1613622-1	. SPRING, Helical compression	1	
-39	1613617-1	. BELLOWS ASSEMBLY	1	
-40	1613610-1	. GASKET	1	

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
8-13-41	1613614-1	. VALVE	1	
-42	1613616-1	. SPRING, Helical compression	1	
-43	1620570-1	. SCREEN, Filter	1	
-44	1620655-1	. CUP, Spring	1	
-45	1620606-1	. HOUSING, Combination valve	1	

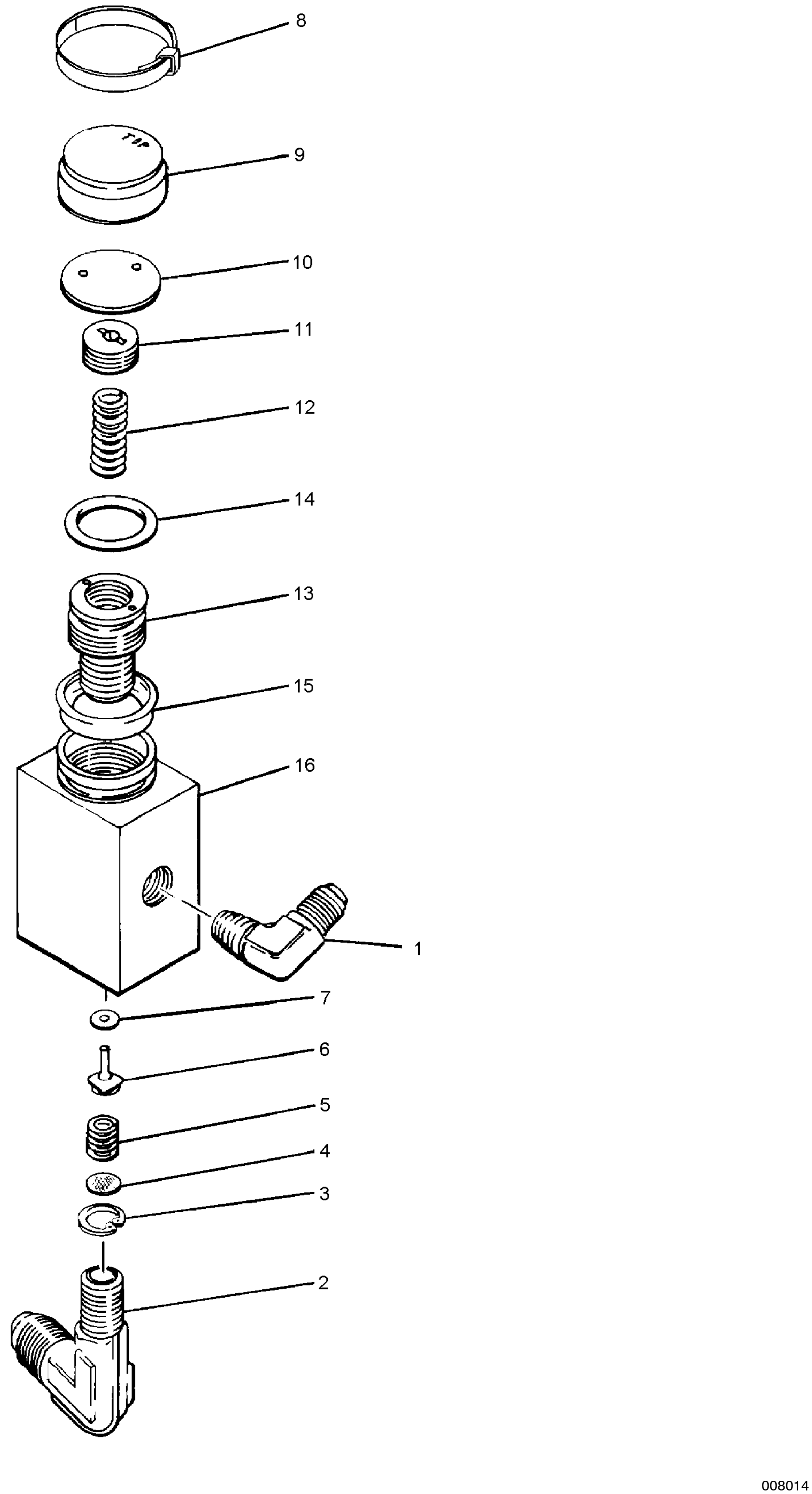


Figure 8-14. Pressure Closing Valve Assembly

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
8-14	1616733-2	VALVE ASSEMBLY, Pressure closing (figure 8-12 for NHA)	REF	
-1	MS20822-5D	. ELBOW	1	
-2	MS20822-5-4D	. ELBOW	1	
-3	MS16625-4037	. RING, Retaining	1	
-4	815634-7	. FILTER	1	
-5	1616732-1	. SPRING, Helical compression	1	
-6	1616730-1	. STEM	1	
-7	1616728-1	. DISC	1	
-8	MS3367-5-8	. STRAP, Tiedown	AR	
-9	1611857-1	. COVER	1	
-10	1611319-1	. DISC, Cupped	1	
-11	1616788-1	. SCREW, Spring adjusting	1	
-12	815735	. SPRING, Helical compression	1	
-13	1616790-1	. BELLOWS ASSEMBLY	1	
-14	815743	. PACKING, O-ring	1	
-15	1627280-1	. RING, Vibration damper	1	
-16	1616697-1	. HOUSING	1	

NUMERICAL INDEX

Part Number	Figure and Index Number	SM&R Code
AN525-832-6	8-12-2	
AN816-5D	8-13-3	PAOZZ
	8-12-26	
AN916-1D	8-12-8	PAOZZ
AN960C61	8-13-14	
C1227C2-1	8-12-51	
C14938SS832	8-12-4	PAGZZ
	8-12-15	
MBFS404SCP	8-13-15	
MS16624-4025	8-13-20	PAOOZ
	8-13-25	
MS16625-4037	8-14-3	PAOZZ
MS16625-4056	8-13-28	PAOZZ
MS16626-4050	8-13-10	PAOZZ
MS20365-440	8-12-49	PAGZZ
MS20822-5-4D	8-14-2	PAOZZ
MS20822-5D	8-12-7	PAOZZ
	8-13-1	
	8-14-1	
MS20823-5D	8-13-2	PAOZZ
MS21045C4	8-12-11	PAOZZ
MS22068-4	8-12-40	PAOZZ
MS22068-6	8-12-34	PAOZZ
MS24693-C27	8-12-45	PAOZZ
MS24693-C50	8-12-37	PAOZZ
MS24693-C52	8-12-36	PAOZZ
MS24693-C6	8-12-48	PAOOZ
MS24693-C95	8-12-43	PAOZZ
MS24694-C125	8-12-10	PAGZZ
MS27566-1	8-13-12	PAOZZ
MS3367-5-8	8-14-8	PAOZZ
MS51957-27	8-13-5	PAOOZ
	8-13-13	
MS51957-43	8-12-13	PAOOZ
NTNO-4SCP	8-12-23	PAOZZ
RO-405SS	8-12-22	PAOZZ
WO-8SS	8-12-3	
	8-12-14	
1-606-1	8-12-20	PAOZZ
1-606-2	8-12-21	
104002	8-12-12	PAOZZ
1600482-1	8-12-53	
1600818	8-13-29	PAGZZ
1600820	8-13-31	PAGZZ
1600821	8-13-33	PAGZZ
1601217-1	8-12	
1602321-17	8-12-38	PAGZZ
1602321-35	8-13-8	PAOZZ
1602412-1	8-13-17	PAOZZ
1603660-113	8-13-23	PAOZZ
1603360-123	8-13-21	
1603661-69	8-13-7	PAGZZ
1611319-1	8-14-10	PAGZZ
1611420-1	8-12-28	
1611421-1	8-12-27	
1611428-2	8-12-29	PAOZZ
1611433-1	8-12-47	PAOZZ
1611434-1	8-12-5	PAGZZ
1611448-1	8-13-22	PAGZZ
1611449-1	8-13-24	PAGZZ
1611453-1	8-12-1	PAOZZ
1611857-1	8-14-9	PAGZZ
1613610-1	8-13-40	PAGZZ
1613614-1	8-13-41	
1613616-1	8-13-42	PAGZZ
1613617-1	8-13-39	PAGZZ
1613622-1	8-13-38	PAGZZ
1616697-1	8-14-16	
1616728-1	8-14-7	PAGZZ
1616730-1	8-14-6	PAGZZ
1616732-1	8-14-5	PAGZZ
1616733-2	8-12-44	PAGZZ
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1616784-1	8-13-32	PAGZZ
1616788-1	8-14-11	PAGZZ
1616790-1	8-14-13	PAGZZ
1616833-1	8-12-54	
1616834-1	8-12-52	
1620304-1	8-13-16	
1620305-1	8-13-18	
1620550-1	8-13-35	PAGZZ
1620570-1	8-13-43	PAGZZ
1620606-1	8-13-45	
1620654-1	8-13-6	
1620655-1	8-13-44	PAGZZ
1620656-1	8-13-26	PAOZZ
1620657-1	8-13-36	PAGZZ
1620658-1	8-13-37	PAOZZ
1620659-1	8-13-4	PAOZZ
1620660-2	8-12-35	PAGZZ
	8-13	
1620663-1	8-13-11	PAGZZ
1622347-1	8-12-30	PAGZZ
1622347-2	8-12-32	PAGZZ

NUMERICAL INDEX (Cont)

Part Number	Figure and Index Number	SM&R Code
1627123-1	8-12-25	
1627124-1	8-12-39	
1627126-1	8-12-42	PAGZZ
1627127-1	8-12-24	
1627128-1	8-12-33	
1627130-1	8-12-6	
1627132-1	8-12-46	
1627133-1	8-12-50	
1627160-1	8-12-41	PAGZZ
1627280-1	8-14-15	
1627687-1	8-12-31	PAGZZ
3263004-0201	8-12	PAOGD

Part Number	Figure and Index Number	SM&R Code
3264001-0201	8-12-9	PAGBZ
6690-1	8-12-16	PAOZZ
6691-1	8-12-17	
778488-5	8-13-27	PAGZZ
813752	8-13-32	KCGZZ
815395	8-13-30	PAGZZ
815404	8-13-9	PAGZZ
815634-7	8-14-4	PAGZZ
815735	8-14-12	PAGZZ
815743	8-14-14	PAGZZ
816919-14	8-13-19	PAGZZ

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CHAPTER 9

LIQUID OXYGEN CONVERTER ASSEMBLY

TYPE GCU-29/A, P/N 3263006-0101

Section 9-1. Description

9-1. GENERAL.

9-2. The Liquid Oxygen Converter Assembly, Type GCU-29/A, P/N 3263006-0101, is manufactured by Litton Life Support, formerly Bendix Corporation (CAGE 99251). The converter assembly is designed to store and convert liquid oxygen (LOX) into gaseous oxygen for the aircrewmember during flight (figure 9-1). Table 9-1 contains the leading particulars for the converter assembly.

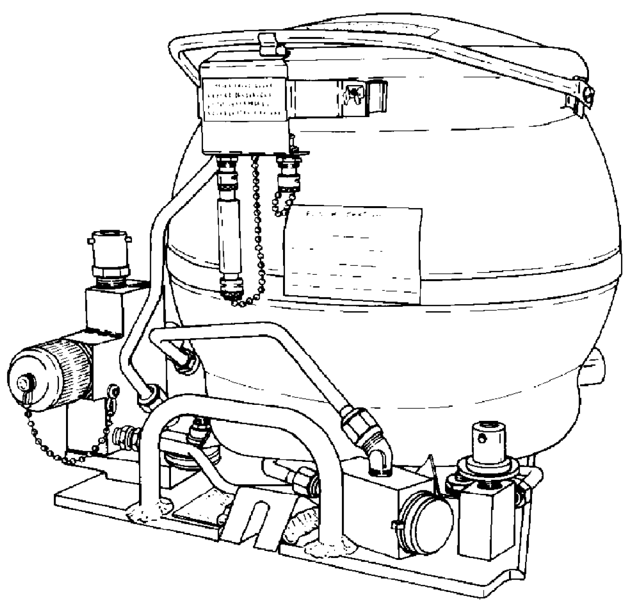

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Figure 9-1. Liquid Oxygen Converter Assembly, Type GCU-29/A, P/N 3263006-0101

Table 9-1. Leading Particulars

Capacity (LOX) 3263006-0101	10 liters
Operating pressure	55 to 90 psig
Operating temperature range	-65°F (-54°C) to +260°F (+127°C)
Relief valve setting	100 to 120 psig
Pressure Control valve setting	55 to 90 psig
Delivery rate	120 lpm (min)
Filling time at 70°F	10 min
Buildup time (max)	5 min

9-3. Oxygen in its liquid state (approximately -297°F (-182°C)), is stored in a spherical assembly consisting of inner and outer shells separated by an annular space. The annular space is evacuated, creating a vacuum which prevents the transmittal of heat through the space. The thermos bottle effect created retards heating and eventual conversion of LOX to gaseous oxygen. Valves, tubing, and fittings incorporated in the converter assembly convert LOX to gas and direct its flow at a controlled rate.

9-4. CONFIGURATION.

9-5. The Liquid Oxygen Converter Assembly, Type GCU-29/A, P/N 3263006-0101, consists of a container assembly, combination valve with relief valve incorporated, pressure closing valve, and associated tubing and fittings. A capacitance-type probe assembly, which sends an electrical signal to a liquid oxygen quantity gage located in the aircraft, is incorporated within the container assembly. The quantity gage indicates the amount of LOX contained in the converter.

9-6. FUNCTION.

9-7. The operational characteristics and performance for which the GCU-29/A converter assembly (P/N 3263006-0101) is designed, are as follows:

1. The converter is filled by attaching the LOX servicing trailer filler valve to the filler port of the combination valve on the converter. When attached, the servicing trailer filler valve depresses the nosepiece and valve poppet of the combination valve. This automatically puts the converter into the fill mode (figure 9-2).

2. With the poppet depressed, the fill and vent ports of the combination valve are opened and the buildup port is closed. This condition allows gas pressure built up in the inner container to vent to the atmosphere. As pressure is vented, LOX in the servicing trailer (which is at a greater pressure, 30 psig), flows through the combination valve and into the converter.

3. As the LOX level rises in the container, pressure created by vaporization of liquid due to heat, turbulence, etc, is vented to the atmosphere. The converter is considered full when LOX flows in a steady stream from the overboard vent line coupling assembly.

4. When the converter is full and the servicing trailer filler valve is disconnected, the nosepiece and poppet of the combination valve return to the extended position (Figure 9-3). This automatically puts the converter into the buildup and supply mode. In this mode the fill and vent ports are closed and the buildup port is open.

5. In the buildup and supply mode, LOX is forced out of the bottom of the inner container and into the buildup coil by the weight of the liquid (figure 9-3). As the LOX-warms and vaporizes into gaseous oxygen in the buildup coil, pressure is created. This pressure is controlled at approximately 75 psig by the opening and closing action of the pressure closing valve.

6. Gaseous oxygen travels from the buildup coil through the supply coupling assembly and the heat exchanger to a shutoff valve in the aircraft cockpit.

7. Gaseous oxygen, under pressure, also passes through the gas and buildup ports of the combination valve to the upper portion of the pressure closing valve. A bellows, inside the pressure closing valve, holds the valve in the open position. As pressure builds, the bellows senses the increases, contracts (at approximately 75 psig), and closes the valve.

8. If no demand is placed on the converter, pressure continues to slowly rise. If allowed to go unchecked, pressure in excess of 12,000 psig could be generated. To prevent this potentially hazardous situation, a relief valve is incorporated. The relief valve is set to relieve excess pressure in the converter assembly at approximately 110 psig.

9. As a demand is placed on the converter by the aircrewmember, LOX is forced into the buildup coil to replace consumed oxygen. As this process is repeated, the LOX level in the converter drops, increasing the void area at the top. As the size of the void area increases, pressure decreases and is sensed by the bellows in the pressure closing valve. When pressure falls below approximately 75 psig, the bellows expands, opening the valve. With the valve open, pressure from the buildup coil passes through the valve and into the top of the container. This pressure, coupled with the pressure created by LOX contained in the converter, again builds to approximately 75 psig and closes the pressure closing valve. This process is repeated as long as a demand is placed on the converter.

10. A heat exchanger is incorporated into the aircraft tubing to warm further the gaseous oxygen to a breathable temperature.

11. An additional relief valve, set at approximately 115 psig, is installed in the aircraft oxygen plumbing to provide additional protection against overpressurization of the converter and supply lines of the system.

9-8. SERVICE LIFE.

9-9. Liquid oxygen converters shall remain in service as long as they continue to function properly.

9-10. REFERENCE NUMBERS, ITEMS, AND SUPPLY DATA.

9-11. Section 9-5, Illustrated Parts Breakdown, contains information on the converter assembly, subassemblies, and component parts. Figure and index numbers, reference or part numbers, description, and units per assembly are provided with the breakdown.

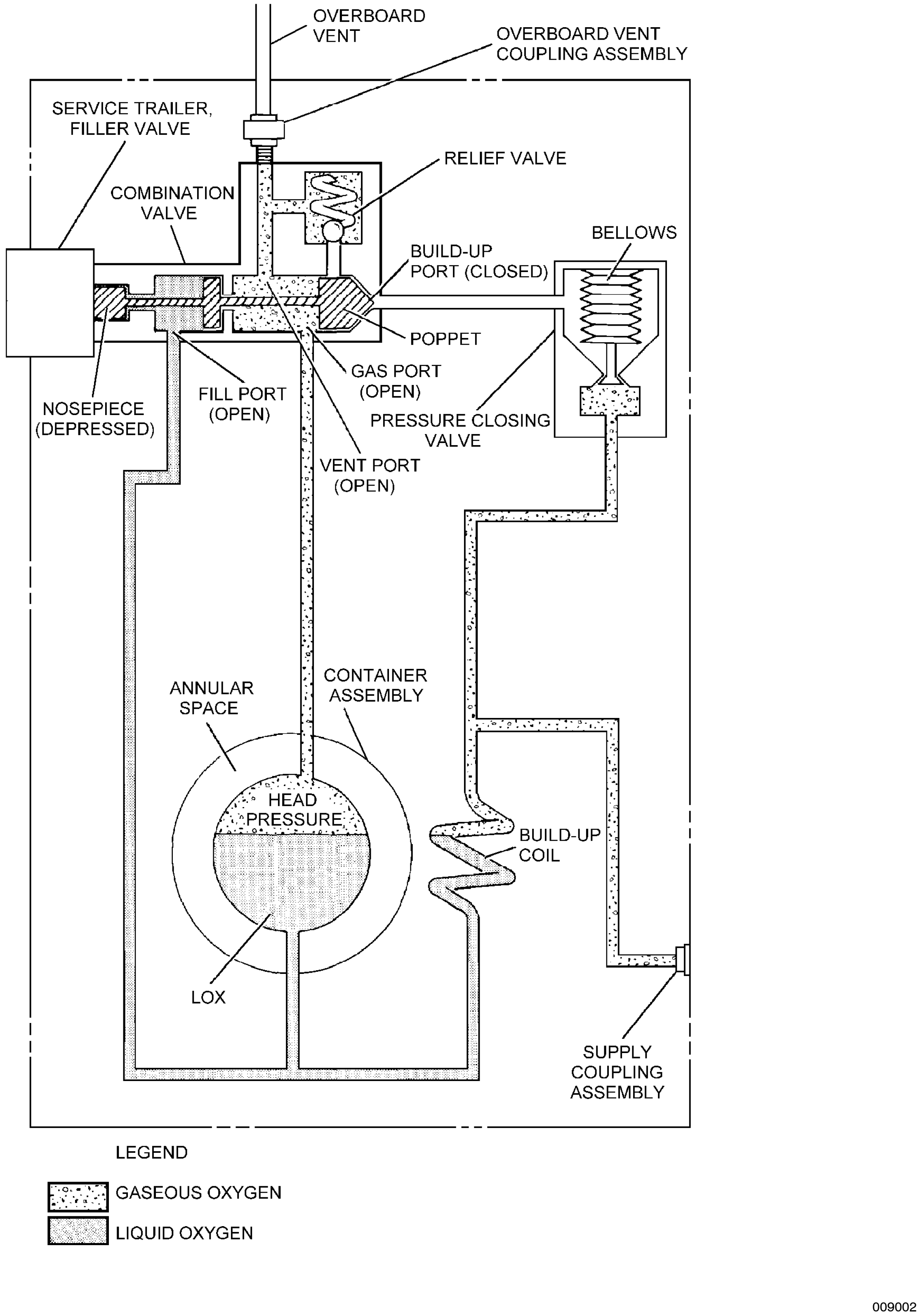


Figure 9-2. Fill Mode (Converter Removed from Aircraft)

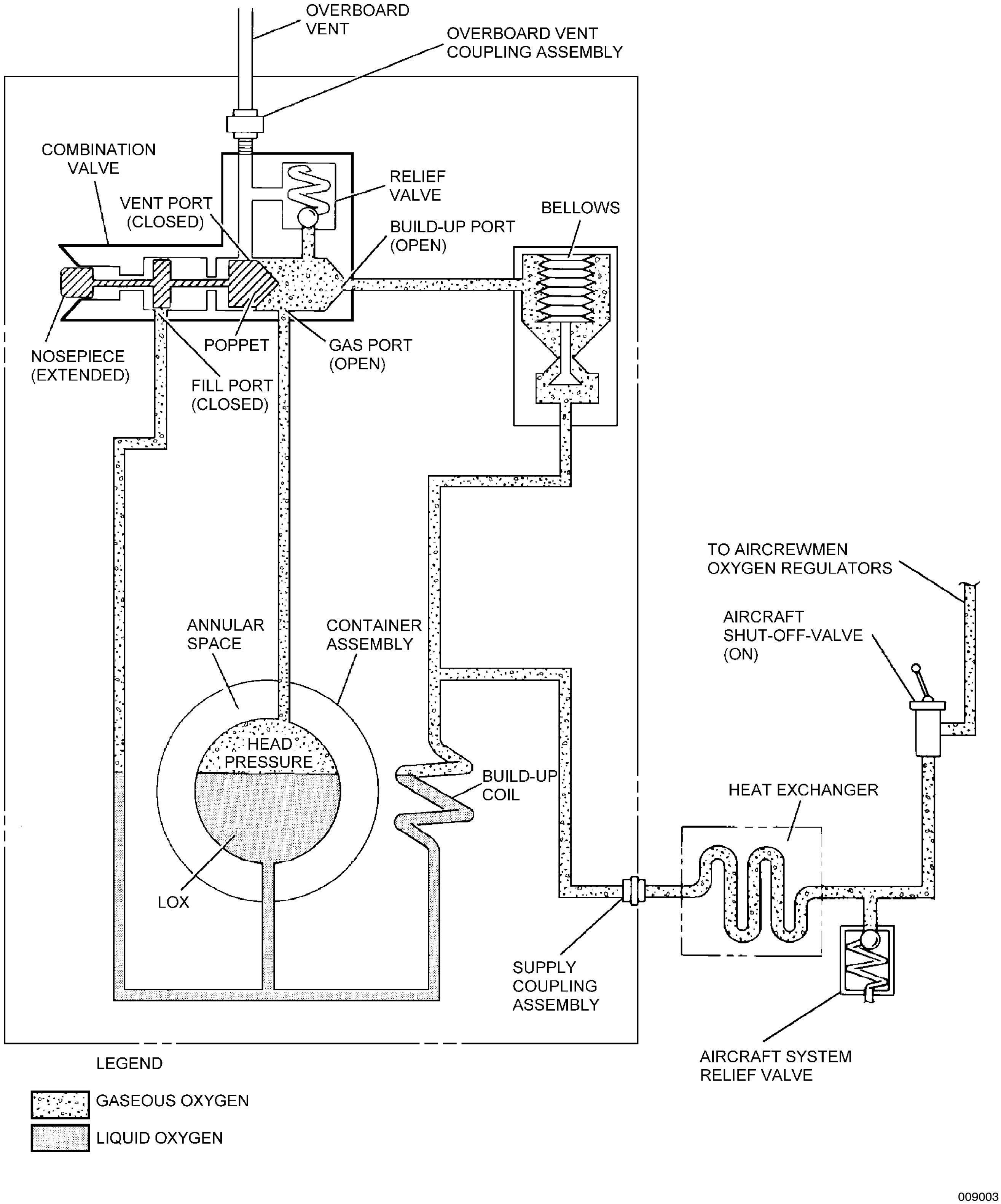


Figure 9-3. Buildup and Supply Mode (Converter Installed)

Section 9-2. Modifications

9-12. GENERAL.

9-13. There are no modifications in the GCU-29/A, P/N 3263006-0101, required/authorized at this time.

Section 9-3. Performance Test Sheet Preparation

9-14. GENERAL.

9-15. Preparation of the Liquid Oxygen Converter Performance Test Sheet utilized during the bench test requires entering the appropriate indicated flows and pressures in the spaces provided (figure 9-4). The indicated flows and pressures shall be extracted from the test stand calibration correction cards. See appropriate ground support equipment manual.

9-16. The test stand calibration correction cards contain all actual flows and pressures required to test all known models of liquid oxygen converters presently in service. Converting actual flows and pressures to indicated flows and pressures is normally accomplished during calibration of the test stand. Refer to appropriate ground support equipment manual for calibration intervals.

9-17. The Performance Test Sheets shall be prepared as shown in figure 9-4. The Performance Test Sheet shown is a sample but can be reproduced for local use.

9-18. The following tests require the extraction of appropriate indicated flows and/or pressures from the test stand calibration correction cards:

1. Converter Leakage Test
2. Relief Valve Test
3. Fill and Buildup Time Test
4. Flow Test
5. Converter Charge

NOTE

For correction card numbers refer to appropriate ground support equipment manual.

9-19. CONVERTER PERFORMANCE TESTS.

9-20. CONVERTER LEAKAGE TEST. The Converter Leakage Test is performed with the converter pressurized with gaseous oxygen to 95 psig. Locate the indicated psig for the actual 95 psig on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

9-21. RELIEF VALVE TEST. The relief valve shall vent at least 100 liters per minute (lpm) with an applied pressure of 100 to 120 psig. The maximum allowable leakage with 100 psig applied is 0.01 lpm. Make the following entries on the Performance Test Sheet:

1. Locate indicated inches of water (inH_2O) for 100 lpm on correction card number 4. Enter indicated inH_2O in space provided on Performance Test Sheet.

2. Locate indicated psig for actual pressures of 95, 100, and 120 psig on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

3. Locate indicated inH_2O for actual flow of 0.01 lpm on correction card number 7. Enter indicated inH_2O in space provided on Performance Test Sheet.

9-22. FILL AND BUILDUP TIME TEST. The time required to fill the converter (10 liters) shall not exceed 10 minutes.

9-23. The time required for the filled converter to build up a working pressure of 55 to 90 psig shall not exceed 5 minutes from time the servicing trailer filler valve is disconnected from converter. Locate indicated psig for the actual psig pressure on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

Performance Test Sheet
TYPE GCU-29S/A LIQUID OXYGEN CONVERTER ASSEMBLY
(BENDIX CORPORATION P/N 3263006-0101)

DATE: ____________ CONVERTER SERIAL NO: ____________ TEST STAND SERIAL NO: ____________

OPERATOR: ____________ CDI: ____________ TARE WEIGHT: ____________

1. CONVERTER PURGE (PURGE 30 MINUTES AT 200°F (93°C) TO 250°F (121°C) AND AT 120 PSIG).

2. INSULATION RESISTANCE TEST (EMPTY).

CONNECTION	MINIMUM ALLOWABLE MEGOHMS	READING
A TO B	2.0	
A TO GROUND	1.0	
B TO GROUND	1.0	

3. CAPACITANCE TEST (EMPTY) READING SHALL BE 121.5 TO 125.5 MICROMICROFARADS (UUF) ____________

4. RELIEF VALVE TEST

VENT FLOW						LEAKAGE					
INLET PRESS (PSIG)			FLOW			INLET PRESS (PSIG)			FLOW		
ACTUAL	INDICATED	PG-1 READING	ACTUAL (LPM)	INDICATED (INH_2O)	PG-2 READING	ACTUAL	INDICATED	PG-1 READING	ACTUAL (LPM)	INDICATED (INH_2O)	PG-2 READING
100			100			95			0.01		
120											

5. CONVERTER LEAKAGE TEST

95 PSIG ACTUAL = ____________ PSIG INDICATED, WITH INDICATED PSIG APPLIED THERE SHALL BE NO LEAKAGE FROM THE PRESSURE CONTROL VALVE, BUILDUP COIL, TUBING AND FITTINGS.

6. FILL AND BUILDUP TIME TEST

A. FILL TIME (MAXIMUM TIME ALLOWED IS 10 MINUTES) ____________

B. BUILDUP TIME (MAXIMUM TIME TO BUILDUP TO 55 TO 90 PSIG IS 5 MINUTES) PSIG ACTUAL = ________ PSIG INDICATED TIME REQUIRED FOR BUILUP ________ MINUTES.

7. CAPACITANCE TEST (FULL)

TOTAL CONVERTER WEIGHT	
CONVERTER TARE WEIGHT	
LOX WEIGHT (W)	
2.33 X W + 64.0 = C (MAX)	
2.25 X W + 63.0 = C (MIN)	
READING	
C = CAPACITANCE IN UUF	W = WEIGHT OF LOX IN POUNDS

Figure 9-4. Converter Performance Test Sheet (Sheet 1 of 2)

8. FLOW TEST (120 LPM WHILE MAINTAINING 55 TO 90 PSIG WORKING PRESSURE)

WORKING PRESS. (PSIG)		FLOW (LPM)		PG-2 READING
ACTUAL	PG-1 INDICATED	ACTUAL	INDICATED	
55		120		
90				

9. EVAPORATION LOSS TEST (BUILDUP AND SUPPLY MODE) MAXIMUM ALLOWABLE LOSS OF LOX IN 24 HOURS IS 3.0 LBS.

NOTE: LOX IN CONVERTER MUST BE STABILIZED FOR 1 HOUR PRIOR TO BEGINNING TEST. DO NOT AGITATE CONVERTER DURING 24 HOUR PERIOD.

A. START TIME ____________________ START WEIGHT ____________________

B. FINISH TIME ____________________ FINISH WEIGHT ____________________

10. EVAPORATION LOSS TEST (VENTED MODE)
MAXIMUM ALLOWABLE LOSS OF LOX IN 24 HOURS IS 5.0 LBS. (PERFORMED ONLY IF CONVERTER FAILS EVAPORATION LOSS TEST IN BUILDUP AND SUPPLY MODE)

A. START TIME ____________________ START WEIGHT ____________________

B. FINISH TIME ____________________ FINISH WEIGHT ____________________

11. CONVERTER CHARGE (OXYGEN)

PRESSURE (PSIG)		
ACTUAL	INDICATED	READING
25		
30		

Figure 9-4. Converter Performance Test Sheet (Sheet 2 of 2)

9-24. FLOW TEST. The converter shall be capable of delivering gaseous oxygen at the rate of 120 lpm while maintaining pressure of 55 to 90 psig. Make the following entries on the Performance Test Sheet:

1. Locate indicated inH_2O for actual flow of 120 lpm on correction card number 4. Enter indicated inH_2O in space provided on Performance Test Sheet.

2. Locate indicated psig for actual pressures of 55 to 90 psig on correction card number 2. Enter actual psig in spaces provided on Performance Test Sheet.

9-25. CONVERTER CHARGE. Upon completing the Bench Test, the converter shall be emptied of LOX and pressurized with gaseous oxygen 25 to 30 psig. This prevents moisture from entering the converter during shipment/storage. Locate indicated psig for actual pressures of 25 to 30 psig on correction card number 2. Enter indicated psig in spaces provided on Performance Test Sheet.

Section 9-4. Maintenance

9-26. GENERAL.

9-27. This Section contains the procedural steps for the inspection, testing, troubleshooting, disassembly, cleaning, repair, assembly, and adjusting of the Liquid Oxygen Converter Assembly, Type GCU-29/A, (P/N 3263006-0101).

NOTE

Upon completion of any maintenance action (e.g., inspection, repair, modification, etc), be sure to complete the required Maintenance Data Collection System forms.

9-28. EMERGENCY PRESSURE RELIEF PROCEDURES. When filling the converter, or at any time, if any of the following situations are encountered: Heavy frosting, icing, or excessive pressure buildup (in excess of 130 psig), perform the following immediately.

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Fixture, Test, Valve, Gage/Relief, Pressure	Fabricate IAW figure 9-6

Support Equipment Required (Cont)

Quantity	Description	Reference Number
1	Line, Drain, Port, Vent	Fabricate IAW figure 9-7
1	Line, Drain, Converter, LOX	Fabricate IAW figure 9-8

WARNING

LOX in a non-vented container will build to 12,000 psig. Converters however, will explode at approximately 1,200 psig.

Do not attempt to relieve pressure in LOX converters that indicate critical overpressurization (figure 9-5). For these converters comply with procedures as prescribed in the individual station/ships emergency procedures bill.

1. Attach pressure gage/relief valve test fixture (figure 9-6) to supply quick-disconnect coupling (39).

2. Attach vent port drain line (figure 9-7) to converter vent port coupling (34). Ensure vent port drain line faces away from operator.

3. Ensure adapter knurl knob is backed out counterclockwise.

WARNING

When performing step 4, if excessive pressure does not relieve through vent port drain line, immediately comply with procedures as prescribed in the individual station/ships emergency procedures bill.

4. Install adapter to the fill port of fill, buildup, and vent valve (35) and relieve pressure from the converter by turning the knurl knob of the adapter clockwise four full turns (this places the converter in the vented mode).

5. Observe the pressure gage/relief valve test fixture until 70 psig is indicated.

6. Remove pressure gage/relief valve test fixture and adapter.

WARNING

When performing step 7, if LOX fails to drain from the converter, disconnect LOX converter drain line, attach adapter to fill, buildup, vent valve (35) and turn knurl knob clockwise 4 full turns. (Organizational Level transport defective converter to AIMD immediately.)

7. Immediately place converter in a LOX drain pan, attach LOX converter drain line (figure 9-8) to supply quick-disconnect coupling (39) and drain LOX from the converter.

8. Organizational Level forward the defective LOX converter to AIMD for Bench Test.

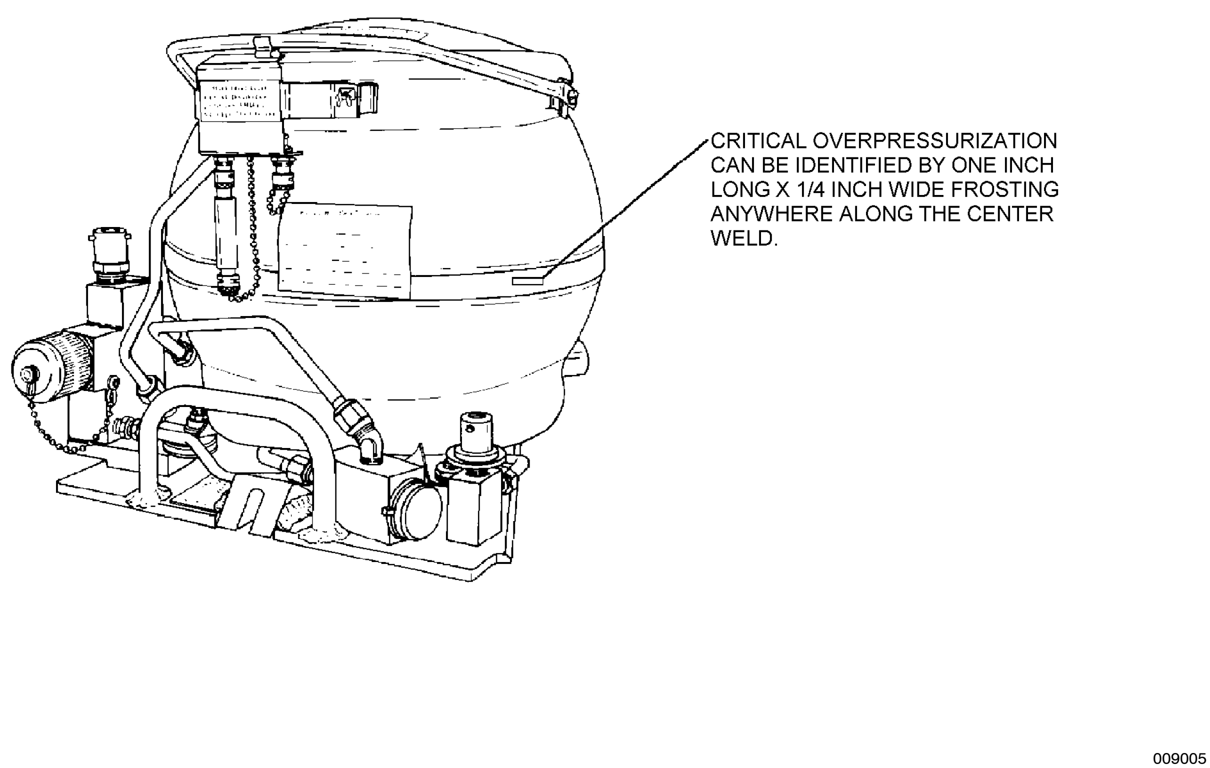


Figure 9-5. Critically Overpressurized Bendix LOX Converter, P/N 3263006-0101

9-29. INSPECTION.

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical over-pressurization, immediately comply with the emergency pressure relief procedures given in paragraph 9-28 at the beginning of this section.

9-30. ACCEPTANCE/TURNAROUND/DAILY/PREFLIGHT/POSTFLIGHT AND TRANSFER INSPECTIONS. The Acceptance/Turnaround/Daily/Preflight/Postflight and Transfer Inspections consist of a Visual Inspection followed by a Functional Test. These inspections and tests shall be performed in conjunction with the aircraft inspection requirements for the aircraft in which the converter is installed. Refer to table 9-2 for troubleshooting assistance.

NOTE

Charge the converter in accordance with paragraph 9-54; ensuring strict compliance with all steps, especially steps 5 and 6.

9-31. Any liquid oxygen converter which does not pass the Visual Inspection or Functional Test shall be removed from the aircraft, drained immediately, and replaced by a Ready For Issue (RFI) liquid oxygen converter. To drain the liquid oxygen converter, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Line, Drain, Converter, LOX	Fabricate IAW figure 9-8

NOTE

If no LOX converter drain line is available, fabricate one in accordance with figure 9-8.

1. Place converter in a LOX drain pan in an area free from dirt and hydrocarbons.

WARNING

Ensure that draining LOX is directed away from all personnel.

2. Attach drain line to converter supply quick-disconnect coupling, which will immediately begin draining converter.

3. Notify Maintenance Control for action to be taken.

9-32. Visual Inspection. Visually inspect the converter assembly and surrounding area for the following:

WARNING

When working with oxygen, make certain that clothing, tubing fittings, and equipment are free of oil, grease, fuel, hydraulic fluid, or any other combustible material. Fire or explosion can result when even slight traces of combustible material come in contact with oxygen under pressure.

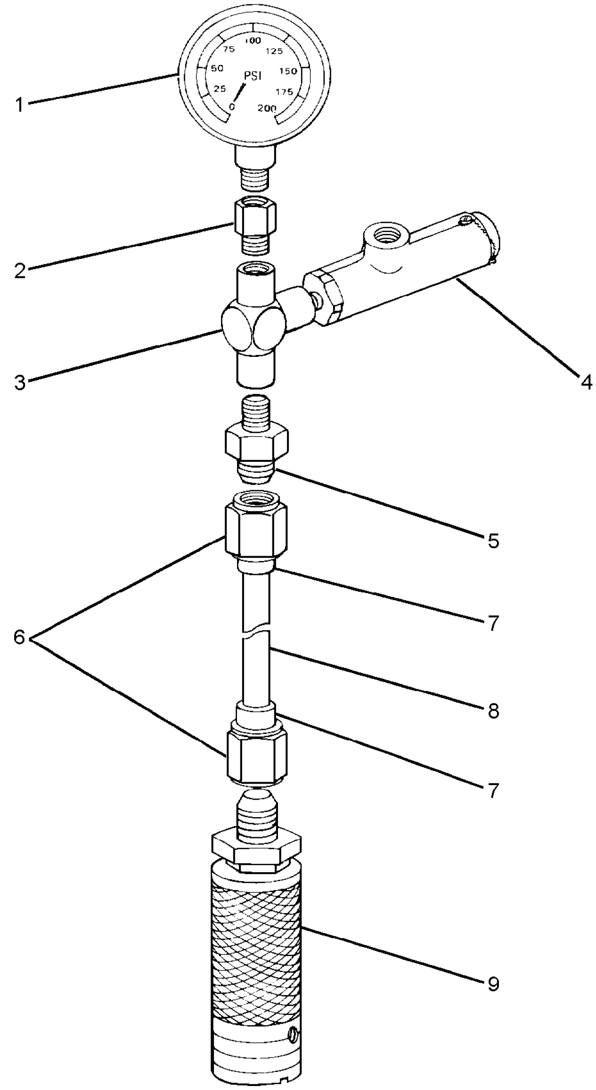
1. Freedom from dirt and hydrocarbons.

2. Correct installation and positioning of all components.

3. Legibility of all markings.

4. Cracks, dents, or other damage to tubing, valves, and electrical connections.

5. Corrosion on converter assembly and surrounding areas.

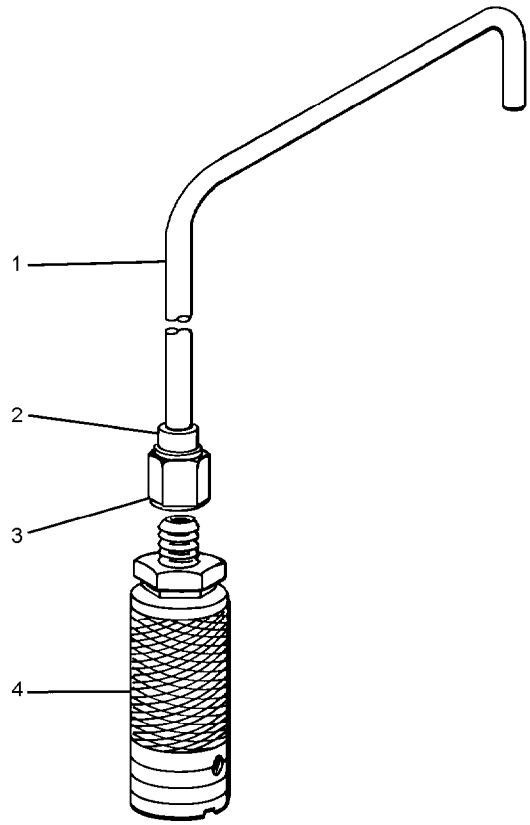


ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY INSTRUCTIONS
1	200 PSIG Oxygen Gage	P/N 100204-18 (CAGE 42527) NIIN 00-961-1990	Anti-seize tape required (Note 1)
2	1/4 to 1/8 in. Reducer, Pipe	P/N 3200X4X2 (CAGE 79470)	Anti-seize tape required
3	Pipe Tee	AN917-1	—
4	Relief Valve	P/N 20C-0005-20 (CAGE 19062) MIL-V-9050D P/N 20C-0050-2	Adjust to relieve at 135 ±5 psig and flow a minimum of 100 lpm. (Note 1) Anti-seize tape required
5	Male Connector	AN816-5D	Anti-seize tape required
6	Tubenut	AN818-5	2 required
7	Tube Sleeve	MS20819-5	2 required
8	Flared Aluminum 6061-T6 Tube (5/16″ O.D. Dia)	—	Cut length 2 1/2 to 3 1/2 in.
9	Supply Quick-disconnect Coupling	MS22608-7 P/N 199000-1 (CAGE 83533)	—

Notes: 1. The Pressure Gage/Relief Valve Test Fixture shall be forwarded to AIMD for relief valve setting, flow test, and leakage test (same as converter relief valve test only higher setting). The 200 PSI Oxygen Gage shall be calibrated in accordance with the metrology and calibration (METCAL) program.

009006

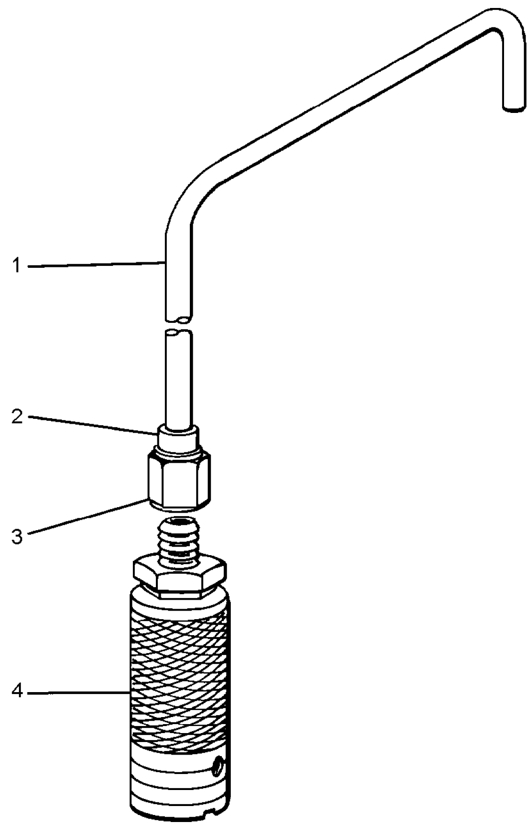
Figure 9-6. Pressure Gage/Relief Valve Test Fixture



ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY INSTRUCTIONS
1	Flared Aluminum 6061-T6 Tube (1/2 O.D. Dia)	—	Cut to 14-inches; bend as shown above
2	Tube Sleeve Coupling	MS20819-5	—
3	Tubenut	AN818-8	—
4	Half Coupling Quick-disconnect	2560000-1 (CAGE 83533)	—

009007

Figure 9-7. Vent Port Drain Line



ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY INSTRUCTIONS
1	Flared Aluminum 6061-T6 Tube (5/16″ O.D. Dia)	—	Cut to 14-inch length; bend as desired
2	Tube Sleeve	MS20819-8	—
3	Tubenut	AN818-5	—
4	Quick-disconnect Coupling	MS22068-7 P/N 199000-1 (CAGE 83533)	—

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Figure 9-8. LOX Converter Drain Line

Table 9-2. Troubleshooting (Acceptance/Turnaround/Daily/Preflight/Postflight and Transfer Inspections)

Trouble	Probable Cause	Remedy
Converter will not fill.	Ice in filler valve or filler obstructs LOX flow.	Thaw filler valve or filler line.
Converter does not fill in required time.	Filler line not properly purged prior to filling.	Purge and cool filler line.
	Converter not sub-cooled before filling.	Lower pressure in servicing trailer and sub-cool converter.
	Filling pressure too low.	Set fill pressure in accordance with servicing trailer operating instructions.
	Defective converter.	Replace converter with RFI converter.
Frost collects on entire outer jacket of converter.	Heat loss due to annular space leakage.	Replace converter with RFI converter.
Converter will fill only partially (gas only emitted from vent).	Converter not sub-cooled prior to filling.	Lower pressure in servicing trailer and sub-cool converter.
System will not build up.	Combination valve defective or partially open.	Replace converter, or thaw valve.
	Pressure relief valve open.	Replace converter with RFI converter.
Oxygen supply consumed too quickly.	Converter not completely filled during filling operation.	Refill converter.
	System leakage.	Locate and repair leaks.
	Combination valve partially open, venting gas.	Replace converter with RFI converter.
Filler line cannot be disconnected from filler valve.	Filler nozzle frozen to filler valve.	Thaw nozzle.
Low or no system pressure.	System leakage.	Locate and repair leaks.
	Pressure closing valve out of adjustment.	Replace converter with RFI converter.
Quantity gage indicates empty.	System empty; defective probes or gage.	Refill converter; replace converter or gage.
LOX system contaminated.	Undesirable odors, or moisture.	Purge system.

6. Obstructions in aircraft overboard vent line.

7. Security of supply, vent, and electrical quick-disconnects.

8. Excessive frosting and/or constant venting of converter assembly.

9. Current date (within last 231 days) on converter bench test decal.

9-33. Functional Test. To functionally test the converter assembly and aircraft oxygen system, proceed as follows:

NOTE

The Functional Test should also be performed whenever a component of the aircraft oxygen system is removed/replaced.

1. Ensure that all fuses associated with LOX quantity indicating system are operational.

NOTE

Refer to applicable aircraft Handbook of Maintenance Instructions (HMI) to determine at what quantity (indicated on quantity gage) low warning light should illuminate.

2. Ensure that electrical power is on. Check quantity gage and low warning light for proper operation.

3. Ensure that oxygen shut-off valve is in OFF position.

4. Attach an oxygen mask, regulator, and regulator-to-seat kit hose assembly to oxygen supply connection in aircraft.

5. Turn oxygen shut-off valve to ON position. Ensure that regulator is in 100% oxygen position. There should be a flow of oxygen through the mask.

NOTE

Resistance during exhalation is due to the positive pressure feature of the regulator.

6. Place mask against face and breathe. There should be a slight resistance during exhalation.

7. Upon completion of Functional Test, turn oxygen shut-off valve to OFF. Disconnect regulator-to-seat kit hose from aircraft supply connection.

9-34. If discrepancies are found or suspected, notify Maintenance Control.

9-35. Remove components of aircraft oxygen system which do not pass inspection and cannot be repaired in the aircraft. Replace with Ready For Issue (RFI) components. Forward defective components to AIMD for Bench Test.

9-36. CALENDAR INSPECTION.

9-37. The Calendar Inspection shall be performed on all liquid oxygen converters that incorporate a quick-disconnect mounting plate prior to placing in service and at intervals not exceeding 231 days thereafter. This interval applies to all converters: aircraft-installed, shop spares, and those maintained in a servicing pool.

9-38. The Calendar Inspection consists of a Visual Inspection followed by a Bench Test. All work shall be performed in a clean, dust-free, and oil-free area. Converter assemblies found to be damaged or out of adjustment shall be repaired by replacing or adjusting the affected part or parts. After repair, repeat the Bench Test.

NOTE

Liquid oxygen converters new from supply, manufacture, or from NARF overhaul do not require the bench test decal. The bench test decal shall be placed on the converter by the local AIMD when the converter is placed in service and after each Bench Test.

9-39. Visual Inspection. Inspect the converter assembly in accordance with table 9-3.

9-40. Liquid oxygen converters failing the Visual Inspection or Bench Test (paragraph 9-41) shall be repaired if specific repair is authorized. SM&R codes define repairable components and levels of maintenance authorized to perform repairs. Further explanation is found in Naval Aviation Maintenance Program Manual, OPNAVINST 4790.2 Series.

9-41. BENCH TEST.

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical over-pressurization, immediately comply with the emergency pressure relief procedures given in paragraph 9-28 at the beginning of this section.

When working with oxygen, make certain that clothing, tubing fittings, and equipment are free of oil, grease, fuel, hydraulic fluid, or any combustible material. Fire or explosion may result when even slight traces of combustible material come in contact with oxygen under pressure.

Prior to use, inspect leak detection compound. Compound which is not clear and free from suspended material/sediment is considered contaminated and shall be disposed of. Compound exhibiting peculiar odors such as acetone or alcohol is considered contaminated and shall be disposed of.

When using leak detection compound carefully avoid getting it on Probe Wire connections as moisture will cause incorrect capacitance/insulation reading.

Tests are arranged so they proceed from one test to the next with a minimum of flow changes. Troubleshooting tables are provided following each test.

NOTE

Some in service liquid oxygen converter test stands that bear part numbers other than those mentioned in paragraph 9-42 still exist. Use of these test stands is authorized if they are capable of monitoring converter performance as specified in the Bench Test.

9-42. The Bench Test shall be performed using Liquid Oxygen Converter Test Stand P/Ns 59A120, 31TB1995-1, 1455AS100-1, or 31TB1995-4. Refer to appropriate ground support equipment manual for identification of test stand controls and indicators referenced in Bench Test procedures. Do not attempt to perform any Bench Test without first becoming thoroughly familiar with the test stand (refer to appropriate ground support equipment manual). Utilize Performance Test Sheet (figure 9-4) when performing Bench Test.

9-43. TARE WEIGHT. To find the Tare Weight of the complete converter assembly, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

NOTE

Tare Weight is the weight of the complete converter assembly less the weight of the LOX.

1. Ensure all LOX has been removed from the converter.

2. Place converter assembly on scale of at least 50-lb capacity. Record weight in space provided on Performance Test Sheet.

9-44. CONVERTER ASSEMBLY PURGE. To purge the converter assembly, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Nitrogen, Oil-free, Water Pumped, Type I, Class I, Grade B	Fed Spec BB-N-411 NIIN 00-985-7275

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
2 ea	Cap Assembly	AN929-5
1	Coupling, Quick-disconnect, Half	256000-1 MS22068-8 (CAGE 83533)
1	Expander, Thread, Screw, Bushing	AN894-8-4
1	Line, Drain, Converter, LOX	Fabricate IAW figure 9-8
1	Purging Unit, Gas/LOX, Model A/M26M-3	3447AS100-1

Table 9-3. Visual Inspection of the Liquid Oxygen Converter, Type GCU-29/A, P/N 3263006-0101

Part Nomenclature	Index Number	Inspect For	Remedy
Note: Index numbers in this table refer to figure 9-12.			
Identification and performance plates.	-53 and -51	Legibility, condition and security.	Secure in place or replace.
Warning and bench test decals.	-52 and -50	Presence and condition.	Replace or apply as required.
Handle.	-1	Bends and cracks.	Replace.
Tubing assemblies and manifold assembly.	-6, -33, and -45	Cracks, dents, nicks, scratches, twists, and proper clearance. Damaged connectors and tube nuts.	Replace damaged tubing assemblies and connectors. Tubing may be slightly bent to maintain a minimum 1/16-inch clearance from other converter components.
Elbows and nipples.	All.	Cracks, dents and scratches.	Replace.
Male coupling assemblies.	-34 and -39	Visible damage.	Replace.
Shock mounts and cup-shock pads.	-29, -30, and -32	Security and condition.	Replace.
Combination valve.	-35	Cracks, damaged poppet valve or nosepiece, or worn helical grooves.	Replace.
Clamps.	-46	Security and condition.	Tighten or replace.
Pressure closing valve.	-43	Cracks or other visible damage.	Replace.
Mounting pad assembly.	-49	Cracks, broken welds, or other visible damage.	Replace damaged components.
Container assembly.	-10	Excessive dents, chipped paint, or other damage.	Refer to paragraph 9-65 for size of acceptable dents. Restore finish by painting (paragraph 9-65).
Converter assembly.	No Index.	Freedom from dirt, hydrocarbons, and corrosion.	Clean (paragraph 9-60) and/or refinish (paragraph 9-65).

WARNING

Use only oil-free nitrogen for purging LOX converters.

Purging unit model A/M26M-3 has two specially designed 3500 psig nitrogen cylinders. Do not substitute these cylinders with other nitrogen cylinders such as NAN cart cylinders.

While operating purging unit model A/M26M-3, protective gloves must be worn by operator. Discharge fittings and hoses can reach temperatures that will cause burns if grasped with bare hands.

NOTE

Personnel operating purging unit model A/M26M-3 should be thoroughly familiar with all valves and controls prior to operating. Refer to appropriate support equipment manual. Personnel operating purging unit model A/M26M-3 shall be licensed in accordance with OPNAVINST 4790.2 Series.

Liquid oxygen converters shall be emptied of all LOX and allowed to warm to ambient temperature prior to purging.

Index numbers in parentheses for LOX converter assembly, refer to figure 9-12.

Index numbers for purging unit model A/M26M-3, refer to figure 9-9.

1. Remove two supply lines (14) from purge unit cabinet. Connect one end of each supply line (14) to nitrogen supply cylinders and the other ends to the supply inlet connections (22) of purge unit.

2. Remove insulated hose (15) from purge unit cabinet. Connect quick-disconnect (18) of insulated hose (15) to system (A) quick-disconnect (19) of purge unit.

3. Screw boss to pipe fitting onto quick-disconnect coupling and attach to B-nut (23) of insulated hose (15).

4. Turn purge unit 3-way valve (20) to system (A) position.

5. Ensure power switch (5) is OFF.

6. Remove power cable (17) from purge unit cabinet and plug into 110 volt outlet.

7. Open both nitrogen supply cylinder valves.

8. Open hand shutoff valves (1) and (3). High pressure gage (4) will indicate nitrogen supply cylinder pressure.

9. Connect quick-disconnect coupling, attached to insulated hose (15), to LOX converter vent port of fill, build up, and vent valve (43).

10. Attach adapter to fill port of LOX converter fill, build up, and vent valve (43). Turn knurl knob of adapter clockwise until it seats, then back off counterclockwise two (2) full turns. This will place the fill, build up, and vent valve half way between the fill/vent and build up/vent modes.

11. Attach LOX converter drain lines (figure 9-8) to LOX converter supply quick-disconnect coupling (16).

12. Turn power switch (5) to ON position. Power on light (6) should illuminate.

13. Turn pressure regulator (11) clockwise until 120 psig is indicated on low pressure gage (2).

NOTE

For LOX converters that show indications of internal probe short, it may be necessary to purge the converter for a longer period of time when performing step 14.

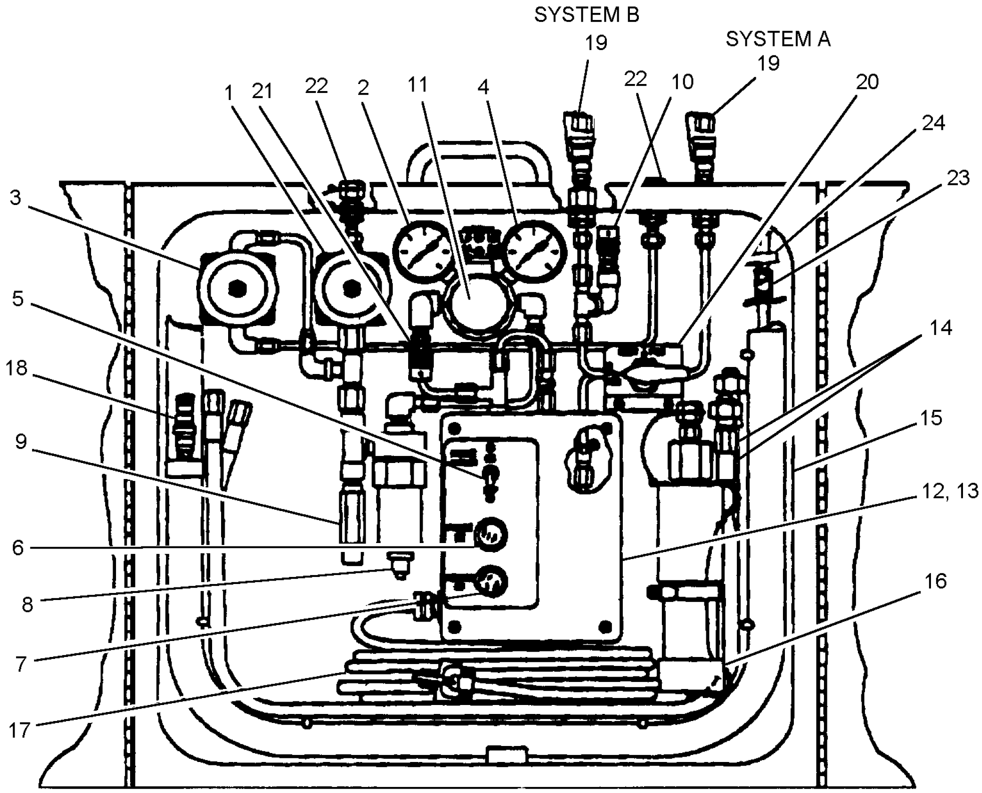
14. Observe heater on light (7). When light cycles from on to off, purge the converter for 30 minutes, with a minimum discharge temperature of 90°F.

15. When purging is completed, turn purging unit power switch (5) to off.

16. Close nitrogen supply cylinder valves.

17. Observe low pressure gage (2) and high pressure gage (4) until they indicate 0 psig. Back out counterclockwise on pressure regulator (11).

18. Close hand shutoff valves (1) and (3).



Description	Function
1. Hand Shutoff Valve	Controls Supply Gas Flow
2. Low Pressure Gage	Indicates Delivery Gas Pressure (0-200 PSIG)
3. Hand Shutoff Valve	Controls Supply Gas Flow
4. High Pressure Gage	Indicates Supply Gas Pressure (0-4000 PSIG)
5. Power Switch	Master On/Off Switch/Circuit Breaker
6. Power On Light	Indicates Master Switch is On and Set is Operational
7. Heater On Light	Indicates Operation of Heater
8. Priority Valve	Stops Gas Flow When Supply Gas Pressure Falls Below 200 PSIG
9. Relief Valve	Relieves Supply Pressure Exceeding 3750 PSIG
10. Low Pressure Relief Valve	Relieves Service Line Supply Pressure Exceeding 705 PSIG
11. Pressure Regulator Assembly	Regulates Pressure to 0-200 PSIG
12. Temperature Control Switch (Under Plate)	Cycles Off and On to Control Exit Gas
13. High Temperature Shutdown (Under Plate)	Shuts Off Heater when Heater Block Temperature Reaches 285°F
14. Supply Line	Connects Supply Cylinders to Housing Assembly
15. Insulated Hose Assembly	Connects Housing Assembly
16. Filler Valve	Connects Insulated Hose Assembly to Converter
17. Power Cable	Connects Unit to Electrical Power
18. Quick Disconnect	Connects Insulated Hose to 19 System A or B
19. Quick Disconnect	Connection for Insulated Hose to 19 System A or B
20. 3-Way Valve	Selects A or B Outlet Ports
21. High Pressure Relief Valve	Relieves Service Line Supply Pressure Exceeding 1355 PSIG
22. Supply Pressure Inlet	Connects Supply Line 14 to Purge Unit
23. B-Nut	Connects Insulated Hose to Filler Valve 16 or Adapter (Not Shown)
24. Adapter	Connects Insulated Hose to P-3 Aircraft Filler Port

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Figure 9-9. A/M26M-3 Purging Unit

19. Disconnect insulated hose (15) from LOX converter vent port fitting of fill, build up, and vent valve (43) and purging unit system (A) quick-disconnect (19).

20. Remove drain lines (figure 9-8) from LOX converter supply quick-disconnect coupling (16).

21. Remove adapter from filler port of fill, build up, and vent valve (43).

22. Stow all lines and accessories and secure from purging.

9-45. INSULATION RESISTANCE TEST (EMPTY). To perform the Insulation Resistance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

CAUTION

Prior to performing insulation Resistance Test (Empty), ensure that voltage divider (17) has been disconnected from B polarity terminal.

NOTE

The minimum acceptable megohm readings have been changed as follows: between A to B, 2.0 megohms; between A to ground and B to ground, 1.0 megohm. These readings are acceptable as long as the converter passes the Capacitance Test (Empty) and Capacitance Test (Full).

1. Secure empty converter in rack provided on test stand counter top.

2. Disconnect voltage divider (17) from B polarity terminal.

3. Using test stand cable assembly, connect converter probe assembly electrical connectors (18 and 19) to terminals marked A and B of liquid oxygen quantity gage capacitance type tester.

4. Turn power switch ON and allow tester to warm up 10 minutes prior to proceeding.

5. Turn MEGOHMMETER RANGE SELECTOR to X-1 position.

6. Turn FUNCTION SELECTOR knob to A TO B position. Record reading in space provided on Performance Test Sheet. Reading shall not be less than 2.0 megohms.

7. Turn FUNCTION SELECTOR knob to A TO GROUND and B TO GROUND positions, respectively. Record readings in spaces provided on Performance Test Sheet. Readings shall not be less than 1.0 megohm in either position.

NOTE

If insulation resistance readings are within the minimum acceptable megohm requirements, proceed to Capacitance Test (Empty).

If insulation resistance readings are less than the minimum acceptable megohm requirements, moisture may still be present in container assembly. Proceed to step 8.

8. Purge converter in accordance with paragraph 9-44 and repeat Insulation Resistance Test (Empty).

NOTE

Converter assemblies that fail the Capacitance Test and cannot be corrected by purging shall be forwarded to the next higher maintenance repair facility.

9. Leave all connections unchanged.

9-46. CAPACITANCE TEST (EMPTY). To perform the Capacitance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

CAUTION

Prior to performing Capacitance Test (Empty), ensure that voltage divider (17) has been disconnected from "B" polarity terminal.

1. Turn CAPACITANCE RANGE SELECTOR knob to X-10 position.

2. Turn FUNCTION SELECTOR knob to CAPACITANCE (UUF) position.

3. Record reading in space provided on Performance Test Sheet. Reading shall be 121.5 to 125.5 micromicrofarads (μμF).

NOTE

If reading is acceptable, proceed to step 5.

If reading is not within 121.5 to 125.5 micromicrofarads, moisture may still be present within the container assembly. Proceed to step 4.

4. Purge converter in accordance with paragraph 9-44, and repeat Capacitance Test (Empty).

NOTE

Converter assemblies that fail the Insulation Resistance Test and cannot be corrected by purging shall be forwarded to the next higher maintenance repair facility.

5. Secure power to tester and disconnect test stand cable assembly from converter and test stand.

9-47. CONVERTER LEAKAGE TEST. To perform the Converter Leakage Test, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	Hose Assembly, Stand, Test	59A120-B5-14
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Index numbers in parentheses refer to figure 9-12.

1. Remove cap assembly (7). Using test stand hose assembly, connect test stand BELL JAR BOTTOM COUPLING (C-1) to tee fitting (8).

2. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

3. Slowly opening OXYGEN SUPPLY valve (V-6) apply 95 psig, as indicated on TEST PRESSURE gage (PG-1) to converter.

4. Maintain 95 psig and inspect for leakage at all connections using leak detection compound. There is no allowable leakage. If leakage is indicated, locate probable cause using troubleshooting table (table 9-4).

5. Close OXYGEN SUPPLY valve (V-6). Bleed test stand using SYSTEM BLEED valve (V-5). Close TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

Table 9-4. Troubleshooting (Converter Leakage Test)

Trouble	Probable Cause	Remedy
Any fitting connection leaking.	Loose connection.	Tighten connection.
Elbow or nipple fitting leaking.	Stripped threads, excessive burrs, deep scratches, inside or outside diameter out of round or loose.	Tighten or replace fitting(s).
Tubing leaking.	Dents, kinks, deep scratches, twisted tubing, improperly flared ends, or damaged connectors.	Replace tubing.

9-48. RELIEF VALVE TEST. To perform the Relief Valve Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cap, Tube	AN929-5
1	Hose Assembly, Stand, Test	59A120-B5-14
1	Hose Assembly, Stand, Test	59A120-B5-52
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Index numbers in parentheses refer to figure 9-12.

1. Ensure that test stand hose assembly (P/N 59A120-B5-14), connecting BELL JAR BOTTOM COUPLING (C-1) to tee fitting (8), is in place.

2. Using test stand hose assembly (P/N 59A120-B5-52), connect converter vent coupling assembly (34) to test stand FLOWMETER connection (NIP-4).

3. Turn FLOWMETER SELECTOR valve (V-1) to the 0-150 lpm position. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly and observe TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2) when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

4. Slowly open OXYGEN SUPPLY valve (V-6) until 100 lpm flow is shown on FLOWMETER INDICATOR gage (PG-2).

5. With a 100 lpm shown on FLOWMETER INDICATOR gage (PG-2) reading on TEST PRESSURE gage (PG-1) will be 100-120 psig. Record reading from TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2) on Performance Test Sheet.

6. Using OXYGEN SUPPLY valve (V-6) and SYSTEM BLEED valve (V-5) reduce pressure applied to converter to 95 psig as indicated on TEST PRESSURE gage (PG-1).

7. Disconnect test stand hose (P/N 59A120-B5-52) from FLOWMETER connection (NIP-4).

CAUTION

Slowly attach test stand hose (P/N 59A120-B5-52) to FLOWMETER connection (NIP-1) while observing FLOWMETER INDICATOR gage (PG-2). Excessive relief valve leakage could damage FLOWMETER INDICATOR gage (PG-2).

8. Turn FLOWMETER SELECTOR valve (V-1) to the 0.0-0.25 position and slowly connect test stand hose (P/N 59A120-B5-52) to FLOWMETER connection (NIP-1).

Table 9-5. Troubleshooting (Relief Valve Test)

Trouble	Probable Cause	Remedy
Relieving below 100 psig.	Relief valve out of adjustment.	Adjust relief valve (paragraph 9-71, step 21).
Relieving above 120 psig.	Relief valve out of adjustment.	Adjust relief valve (paragraph 9-71, step 21).
Relief valve fails to vent 100 lpm.	Relief valve out of adjustment.	Adjust relief valve (paragraph 9-71, step 21).
Leakage in excess of 0.01 lpm.	Relief valve out of adjustment.	Adjust relief valve (paragraph 9-71, step 21).
Relief valve cannot be adjusted to tolerances.	Defective parts.	Replace defective parts.

9. While maintaining 95 psig to the converter with OXYGEN SUPPLY valve (V-6) check for leakage indicated on FLOWMETER INDICATOR gage (PG-2). Maximum allowable leakage is 0.01 lpm. Record reading on Performance Test Sheet.

10. If leakage is excessive or if relief valve fails to vent at required flow and pressure, locate probable cause using troubleshooting table (table 9-5).

11. Close OXYGEN SUPPLY valve (V-6). Bleed test stand using SYSTEM BLEED valve (V-5). Close TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

12. Disconnect test stand hose assemblies from converter and from test stand.

NOTE

The tee fitting which was installed in paragraph 9-47 will be left on the converter to provide a test port for Bench Test procedures.

13. Cap tee fitting using tube cap.

14. Remove converter assembly from test stand.

9-49. FILL AND BUILDUP TIME TEST. To perform the Fill and Buildup Time Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Fixture, Test, Valve, Gage/Relief, Pressure	Fabricate IAW figure 9-6
1	Line, Drain, Port, Vent	Fabricate IAW figure 9-7

WARNING

Because of the extremely low temperature of LOX, use extreme care at all times when handling LOX. Ensure that prescribed protective clothing is worn and all safety precautions are observed (Chapter 3).

Ensure venting LOX is directed away from all personnel in the area.

NOTE

Personnel servicing LOX converters and operating LOX transfer equipment shall be qualified and licensed in accordance with OPNAVINST 4790.2 Series.

To perform this test, it will be necessary to take the converter to a LOX servicing trailer in the immediate area of the Oxygen Shop. Any other method that meets the requirements of the test and does not violate safety precautions outlined in Chapter 3 is acceptable.

1. Connect the converter to the servicing trailer.

NOTE

If servicing trailer being used is not the closed loop type, attach a vent port drain line (figure 9-7) to the vent port coupling (34). Ensure vent port drain line is attached to route venting LOX away from all personnel.

2. Note the time, and fill the converter, following applicable instructions for specific ground support equipment servicing trailer being used.

3. When converter is full, note the time. Time required to fill the converter shall not exceed 10 minutes. Record the fill time in space provided on Performance Test Sheet.

4. Note the time and disconnect and secure the servicing trailer (remove vent port drain line if installed). Time noted is beginning of buildup time test.

NOTE

The test pressure gage relief valve test fixture shall be forwarded to the Intermediate Maintenance activity every 6 months for pressure gage calibration and relief valve adjustment and leakage test.

5. Immediately after servicing, attach pressure gage/relief valve test fixture (figure 9-6) to converter supply quick-disconnect coupling (16) and observe for 5 minutes; the following actions should occur:

a. The converter should begin to build head pressure as indicated on the pressure gage/relief valve test fixture. Initially the converter will build a pressure that will cause the LOX converter relief valve to relieve (110 to 120 psig). This action may occur twice.

WARNING

When performing step 5b, if pressure fails to stabilize, drain the LOX converter and forward to Intermediate Level maintenance.

b. After step 5.a. occurs, pressure indication on the pressure gage/relief valve test fixture should stabilize at LOX converter pressure closing valve setting of 55 to 90 psig (a slight fluctuation of 2 to 3 psig on the pressure gage/relief valve test fixture will be present).

6. Disconnect pressure gage/relief valve test fixture from supply quick-disconnect coupling.

7. If converter fails to build head pressure, converter relief valve fails to relieve between 110 to 120 psig, or converter fails to stabilize between 55 to 90 psig, refer to troubleshooting table (table 9-6).

9-50. CAPACITANCE TEST (FULL). To perform the Capacitance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

Table 9-6. Troubleshooting (LOX Converter After Servicing)

Trouble	Probable Cause	Remedy
Converter fails to build head pressure.	Converter fill, buildup, and vent valve failed to return to build-up and supply mode.	Foward converter to AIMD for purge or valve replacement and Bench Test. Drain converter by removing tube assembly (index number 6, figure 9-12). Place converter upside down in drain pan and allow to drain by gravity flow process.
Converter relief valve fails to relieve between 110 to 120 psig.	Converter relief valve out of adjust ment or defective.	Forward converter to AIMD for relief valve adjustment or replacement and Bench Test.
Converter pressure continues to build and will not stabilize.	Converter pressure closing valve defective.	Forward converter to AIMD for pressure closing valve replacement and Bench Test.

CAUTION

Prior to performing Capacitance Test (Full), ensure that voltage divider (17) has been disconnected from “B” polarity terminal.

NOTE

This test requires simultaneous use of the 50-lb capacity scale and the quantity gage capacitance type tester incorporated in the test stand. Ensure that scale is positioned close enough to tester.

1. Place full converter on a scale of at least 50-lb capacity.

2. Using test stand cable assembly, connect converter probe assembly electrical connectors (18, 19) to terminals marked A and B of liquid oxygen quantity gage capacitance type tester.

3. Turn power ON and allow tester to warm up 10 minutes before proceeding.

4. Turn CAPACITANCE RANGE SELECTOR knob to 10X position.

5. Turn FUNCTION SELECTOR knob to CAPACITANCE (UUF) position.

6. Enter total weight of full converter in space provided on Performance Test Sheet.

7. Enter Tare Weight of converter in space provided on Performance Test Sheet.

NOTE

If the weight of the LOX in the converter is 24 lbs 4 oz, 24 lbs 8 oz, and etc.; the ounces must be converted to decimal.

Example

24 lb 4 oz = 24-4/16 lbs
24-4/16 lbs = 24.25 lbs

Enter 24.25 on the Performance Test Sheet.

8. Subtract Tare Weight of converter from total weight. Enter this figure on Performance Test Sheet. This is weight of LOX in converter.

9. Calculate the capacitance maximum (C-max) by multiplying the weight of the LOX (W) by 2.33 and adding 64.0 to the result (2.33(W) + 64.0 = C-max). Enter the result in the space provided on the Performance Test Sheet.

10. Calculate the capacitance minimum (C-min) by multiplying the weight of the LOX (W) by 2.25 and adding 63.0 to the result (2.25(W) + 63.0 = C-min). Enter the result in space provided on Performance Test Sheet.

11. Observe and record capacitance reading from test stand capacitance gage in space provided on Performance Test Sheet. Reading shall be between minimum and maximum established in steps 9 and 10.

NOTE

If capacitance reading is acceptable, proceed to step 14.

If capacitance reading is not within the calculated limits and the converter has not been purged in previous tests, moisture may be present within the container assembly. Proceed to steps 12 and 13.

12. Purge converter in accordance with paragraph 9-44.

13. Fill converter with LOX, and repeat Capacitance Test (Full).

NOTE

If capacitance reading is still not within the calculated limits, the converter shall be forwarded to the next higher maintenance repair facility.

14. Secure tester, and disconnect cable from converter and tester.

15. Connect voltage divider (17) to “B” polarity terminal.

16. If converter passes Capacitance Test, proceed to FLOW TEST, paragraph 9-51.

9-51. FLOW TEST. To perform the Flow Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Hose Assembly, Stand, Test	59A120-B5-12
1	Hose Assembly, Stand, Test	59A120-B5-1
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Secure converter in rack provided on test stand counter top.

2. Close TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

3. Using test stand hose assembly (P/N 59A120-B5-12), interconnect test stand FLOWMETER connection (NIP-4) to CONVERTER SUPPLY OUTLET connection (NIP-5).

4. Using test stand hose assembly (P/N 59A120-B5-1), connect test stand SUPPLY-TO-CONVERTER connection (NIP-6) to converter supply quick disconnect coupling assembly (39).

NOTE

If TEST PRESSURE gage (PG-1) reads above 90 psig, attach fill vent adapter to the fill, buildup and vent valve. Vent converter system pressure to 70 psig by turning knurled knob clockwise.

5. Place test stand FLOWMETER SELECTOR valve (V-1) in the 0-150 lpm position. Open TEST PRESSURE GAGE BUILD-UP AND FLOW valve (V-10).

CAUTION

Open valve, V-9, slowly. Because of buildup of pressure within converter, damage to test stand gages could result from a rapid surge of pressure.

6. Slowly open CONVERTER SUPPLY FLOW CONTROL valve (V-9) and observe FLOWMETER INDICATOR gage (PG-2). Flow the converter for 5 minutes.

7. Using CONVERTER SUPPLY FLOW CONTROL valve (V-9) maintain a 120 lpm flow. The converter shall maintain pressure of 55 to 90 psig as indicated on TEST PRESSURE gage (PG-1). Record pressure in space provided on Performance Test Sheet.

8. If converter supply pressure is not within limits, locate probable cause using troubleshooting table (table 9-7).

9. Remove the converter from test stand and allow it to remain undisturbed for 1 hour.

9-52. EVAPORATION LOSS TEST (BUILDUP AND SUPPLY MODE). To perform the Evaporation Loss Test in the buildup and supply mode, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

Table 9-7. Troubleshooting (Flow Test)

Trouble	Probable Cause	Remedy
Converter fails to maintain operating pressure.	Pressure closing valve out of adjustment.	Adjust (paragraph 9-73, step 17).
	Pressure closing valve damaged.	Rebuild or replace.

1. Gently place converter on scale and record time and converter weight on Performance Test Sheet.

2. Place converter assembly aside and allow it to remain undisturbed for 24 hours.

3. Carefully place converter on scale and record time and weight in spaces provided on Performance Test Sheet. Weight loss in 24 hours shall not exceed 3.0 lbs.

4. If weight loss is 3.0 lbs or less, and there is no excessive frosting of the sphere assembly, drain LOX from converter and proceed to Converter Charge (paragraph 9-54). If weight loss is in excess of 3.0 lbs or if there is sphere assembly frosting, consult troubleshooting table (table 9-8), then proceed to paragraph 9-53.

9-53. EVAPORATION LOSS TEST (VENTED MODE). To perform the Evaporation Loss Test in the vented mode, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

NOTE

This test is required only if converter fails Evaporation Loss Test in buildup and supply mode. By comparing the weight loss of this test to that recorded during the buildup and supply Evaporation Loss Test, it is possible to determine whether sphere assembly degradation, vacuum loss, fitting leakage, or valve malfunction was responsible for converter failure during the buildup and supply Evaporation Loss Test.

1. With converter still on scale, attach test stand fill valve adapter to combination valve on converter.

WARNING

Venting a converter that is in a buildup and supply mode causes a blast of LOX from vent port (figure 9-12, item 34). Ensure that vent blast is directed away from all personnel, and that adequate clothing and facial protection are worn.

2. Turn knurled knob of adapter clockwise until it seats. This will place converter in vented mode.

3. After converter stabilizes, record time and weight in spaces provided on Performance Test Sheet.

4. Place converter aside and allow it to remain undisturbed in vented mode for 24 hours.

5. At end of 24-hour period, carefully place converter on scale.

6. Record time and weight in spaces provided on Performance Test Sheet. Weight loss in 24 hours shall not exceed 5 lbs.

Table 9-8. Troubleshooting (Evaporation Loss Test, Buildup and Supply Mode)

Trouble	Probable Cause	Remedy
Excessive weight loss.	Loss of vacuum in container assembly.	BCM converter assembly.
Excessive weight loss (Evaporation Loss Test (buildup and supply mode)).	Excessively leaking valves, tubing, and/or fittings.	Replace valves. Tighten or replace fittings. Repeat Converter Leakage Test (paragraph 9-47).
	Pressure closing valve out of adjustment or defective.	Adjust (paragraph 9-73, step 17). Replace.
Excessive frosting of container assembly.	Loss of vacuum in container.	BCM converter assembly.

NOTE

A converter that loses 5.0 lbs or less in the vented mode and the weight loss is more than in the buildup and supply mode (example A) shall be considered an acceptable unit. If the weight loss is more than 5.0 lbs (example B) or if the weight loss is less than it was in the buildup and supply mode (example C) located probable cause using troubleshooting table (table 9-9).

Example A:
Weight loss
buildup and supply mode = 3.5 lbs.
Weight loss vented mode = 4.0 lbs.
Converter is RFI.

Example B:
Weight loss
buildup and supply mode = 4.0 lbs.
Weight loss vented mode = 6.0 lbs.
Locate probable cause
using troubleshooting chart.

Example C:
Weight loss
buildup and supply mode = 4.0 lbs.
Weight loss vented mode = 3.0 lbs.
Locate probable cause
using troubleshooting chart.

7. Remove fill valve adapter installed in step 1.

WARNING

Ensure that all personnel safety precautions are observed during converter drain.

8. Place converter in a LOX drain pan and drain converter completely of all LOX.

9-54. CONVERTER CHARGE. To charge the converter, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Coupling, Quick-disconnect (Female)	199000-1 MS22068-7
1	Hose Assembly, Stand, Test	59A120-B5-14
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

Table 9-9. Troubleshooting (Evaporation Loss Test, Vented Mode)

Trouble	Probable Cause	Remedy
Excessive weight Loss Evaporation Loss Test (vented).	Loss of vacuum in container assembly.	BCM converter assembly.
Weight loss in vented mode is less than in the buildup and supply mode.	Excessively leaking valves, tubing, and/or fittings when unit failed buildup and supply mode Evaporation Loss Test.	Replace valves. Tighten or replace fittings. Repeat Converter Leakage Test (paragraph 9-47).
	Pressure closing valve out of adjustment or defective when unit failed buildup and supply mode Evaporation Loss Test.	Adjust (paragraph 9-73, step 17). Replace.
Excessive frosting of container assembly.	Loss of vacuum in container.	BCM converter assembly.

NOTE

Liquid oxygen converters that fail Bench Test and are beyond capability of maintenance (BCM) do not require converter charge.

CAUTION

Upon completion of Bench Test, converter shall be charged with gaseous oxygen to 25 to 30 psig to prevent entry of moisture and other contaminants during shipment/storage.

1. Secure converter in rack provided on test stand counter top.

2. Attach quick-disconnect coupling to test stand hose assembly supply.

3. Using hose assembly, connect test stand BELL JAR BOTTOM COUPLING (C-1) to converter supply coupling assembly (39).

4. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

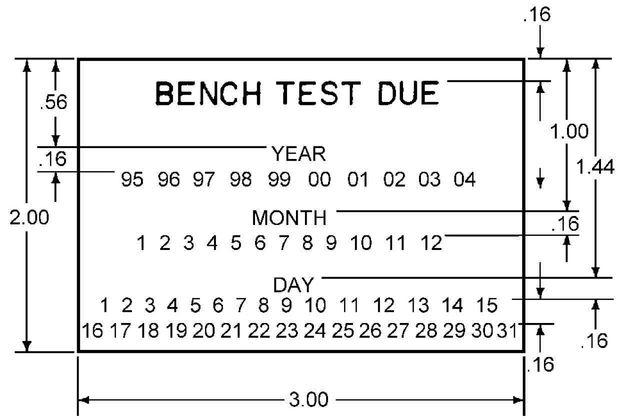
5. Using OXYGEN SUPPLY valve (V-6), charge converter to 25 to 30 psig. Pressure will be indicated on TEST PRESSURE gage (PG-1).

6. Close OXYGEN SUPPLY valve (V-6), disconnect hose assembly connected in step 2 and bleed test stand using SYSTEM BLEED valve (V-5). Secure all test stand valves.

7. Test stand operator and CDI sign Performance Test Sheet. Retain Performance Test Sheet until next scheduled Bench Test is performed.

8. Mark due date of next Bench Test on bench test decal (figure 9-10). Due date shall be 231 days from last Bench Test date. Affix decal to converter in a position in which it will be visible when converter is installed in aircraft.

9. Annotate station/ship performing Bench Test on a serviceable condition label and affix to bench test decal so as not to interfere with marked due date.



NOTES:

1 MATERIAL SHALL BE ELASTOMERIC PRESSURE SENSITIVE TYPE ADHESIVE BACKED, IN ACCORDANCE WITH MIL-M-43719, TYPE I, CLASS 1.
2 ALL LETTERS AND NUMBERS SHALL APPROXIMATELY MATCH GREEN NO. 14187 OF FED. STD. NO. 595; BACKGROUND SHALL APPROXIMATELY MATCH WHITE NO. 17875 OF FED. STD. NO. 595.
3 BENCH TEST DUE SHALL BE 18-POINT GOTHIC (SANS SERIF) LETTERING. ALL OTHER NUMBERS AND LETTERS SHALL BE 10-POINT, GOTHIC (SANS SERIF).

009010

Figure 9-10. Bench Test Decal

NOTE

Bench test decals may be procured from Customer Service at the nearest NARF.

10. Install dust covers or plugs in/on all open couplings prior to shipping or storage of converter.

9-55. DISASSEMBLY.

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical over-pressurization, immediately comply with the emergency pressure relief procedures given in paragraph 9-28 at the beginning of this section.

9-56. LIQUID OXYGEN CONVERTER ASSEMBLY. To disassemble the liquid oxygen converter, use index numbers assigned to figure 9-12 unless otherwise noted. Disassemble the converter only as far as necessary to correct any malfunctions or damage. Disassemble the converter as follows:

CAUTION

All disassembly, inspection, repair and assembly must be done on benches having good lighting and in an area provided with air conditioning. Walls, floor, and ceiling should have a smooth finish and should be painted with a nonchalking paint which can be kept clean and dust free. It is desirable to keep all parts for each individual LOX converter separated. Make careful note of the location, angle of fitting, and quantity of all parts. Plastic-partitioned boxes should be used to keep the parts segregated and protected from dirt and moisture. Plastic bags are also useful for storing subassemblies and component parts after cleaning and inspection until ready for assembly.

NOTE

Discard all O-rings, gaskets, seals, and anti-seize tape removed from oxygen connections during disassembly.

No special tools are required to disassemble, adjust or assemble this converter.

1. Remove handle (1) by removing two screws (2), two washers (3), two bushings (5), and two nuts (4).

2. Loosen top tube nut on vent tube assembly (6) and tube nut on manifold assembly (45) connected to tee fitting (8) on container. Remove tee fitting (8), cap assembly (7), and elbow (9) from container assembly.

3. Remove container assembly (10) by removing screws (11), nuts (12), and shock mount assemblies.

NOTE

A shock mount assembly consists of two washers (31), shock mount (30), two cup-shock pads (29), and shock mount (32).

4. Remove vent tube assembly (6) by loosening bottom tube nut on combination valve assembly (35).

5. Remove buildup port tube (33) by loosening tube nut at each end.

6. Remove coupling assembly (34) from combination valve.

7. Disconnect manifold assembly (45) by loosening tube nuts from combination valve (35), pressure closing valve (43), and manifold block (41).

8. Remove combination valve (35) and valve mounting plate (38) from mounting pad assembly (49) by removing four screws (36).

9. Remove combination valve (35) from valve mounting plate (38) by removing four screws (37).

10. Remove pressure closing valve (43) by removing two screws (44).

11. Remove coupling assembly (39) and remove manifold block assembly (41) by removing two screws (42).

12. Remove manifold assembly (45) by removing screws (47) and nuts (48) which release securing clamps (46).

9-57. CONTAINER ASSEMBLY. To disassemble the container assembly, proceed as follows:

1. Remove voltage divider (17) by cutting lockwire.

2. Disconnect cap and chain assemblies (22, 23) by removing screw (24) and nut (25).

3. Remove two nuts and two washers holding electrical connectors (18, 19) in place on bracket (26).

4. Remove fuse clip (13) on top of bracket (26) by removing screw (14), washer (15), and nut (16).

5. Remove connector bracket (26) by removing screws (14), washers (15), nuts (16), and fuse clips (13).

9-58. COMBINATION VALVE ASSEMBLY. To disassemble the combination valve, proceed as follows:

NOTE

Index numbers in parentheses refer to figure 9-13.

1. Remove elbow (1), nipple (2), and elbow (3) from combination valve assembly.

WARNING

Buildup seat (4) is spring loaded. Use caution when removing.

2. Remove buildup seat (4), clamping spacer (6), washer (7), and preformed packing (8) from combination valve housing (45) by removing screws (5). Remove helical compression spring (9) and ball valve (11) with attached ring (10) from buildup port.

3. Using retaining ring pliers, remove ring (10) from ball valve (11).

4. Remove cap assembly (12) from combination valve housing (45) by removing screw (13) and washer (14).

5. Remove bristo setscrew (15). Using a strap wrench, remove filler head (16) and gasket (18) from combination valve housing.

6. Extract shaft (26) with preformed packing (19), ring (20), washer (21), spring (22), washer (23), sleeve (24), and ring (25) attached from housing (45).

7. Remove preformed packing (19) from shaft (26).

8. Using retaining ring pliers, remove ring (20) and slide off washer (21), spring (22), washer (23), and sleeve (24); then using retaining ring pliers, remove ring (25).

9. Extract expansion plug (27) and packing from housing (45).

10. Using retaining ring pliers, remove ring (28) and extract washer (29), spring (30), check valve head (31), sleeve (32), seat (33), and O-ring (34).

11. Using a spanner wrench, remove retainer (35) from housing (45), and extract spring (38), bellows (39), gasket (40), valve (41), spring (42), screen (43), and cup (44).

NOTE

If disassembly of retainer (35) is required, note relative position of stop screw (36) and adjusting screw (37). This will allow for a good starting point for assembly and adjustment.

12. Disassemble retainer (35), by removing stop screw (36) and adjusting screw (37).

9-59. PRESSURE CLOSING VALVE ASSEMBLY. To disassemble the pressure closing valve, proceed as follows:

NOTE

Index number in parentheses refer to figure 9-14.

1. Remove nipple (1) and elbow (2) from housing (16).

2. Using retaining ring pliers, remove ring (3) and extract filter (4), spring (5), stem (6), and disc (7).

3. Cut off strap (8) and remove cover (9) and disc (10).

4. Using a spanner wrench, remove bellows assembly (13) and O-ring (14).

NOTE

If disassembly of bellows assembly (13) is required, note relative position of adjusting screw (11). This will provide initial adjustment used later in assembly.

5. Disassemble bellows assembly (13) by removing O-ring (14), adjusting screw (11), and spring (12).

9-60. CLEANING.

9-61. To clean the disassembled converter, proceed as follows:

Materials Required

Quantity	Description	Reference Number
1	Wash Bottle	MS36070A
As Required	Bag, Plastic	MIL-B-117
As Required	Nitrogen, Oil-free, Water Pumped, Type I, Class I, Grade B	Fed Spec BB-N-411 NIIN 00-985-7275

WARNING

Do not use oil or any material containing oil in conjunction with oxygen equipment. Even in a minute quantity, oil that comes into contact with oxygen can cause explosion or fire. Dust, lint, or fine metal particles are also dangerous.

1. Clean all metallic parts using procedures outlined in NAVAIR 13-1-6.4-1. Blow dry with oil-free nitrogen.

2. Prior to installation, wash all silicone rubber parts in distilled water and blow dry with oil-free nitrogen.

3. After cleaning, surfaces shall be examined for cleanliness. Should further contamination be found, reclean parts in accordance with step 1.

4. Seal cleaned parts in plastic bags for storage. Bag all complete assemblies that are not immediately returned to service.

9-62. INSPECTION OF DISASSEMBLED PARTS.

9-63. Inspect the disassembled converter and component parts in accordance with table 9-10 and the following special instructions:

1. Inspect all hardware items (nipples, elbows, etc.) for stripped threads, burrs, nicks, distortion, rust, corrosion, or other defects.

NOTE

Because of the method of suspension of shockmounting of the inner container, some looseness can be detected in most containers by shaking the converter vigorously. Some models employ a springtype suspension that eventually loses some tension; others have a nylon type spacer that experiences slight shrinkage. Looseness and rattles become more apparent with age. Some looseness can be detected in many new containers. Looseness or rattles are not criteria for determining serviceability. The integrity of the container is determined by the 24-hour Evaporation Loss Test.

9-64. REPAIR.

9-65. Repair of the converter assembly is limited to replacing defective components, minor repairs (small dents, scratches, abrasions, nicks, etc.) of tubing and assembly, attachment of pinch-off-tube protective cover, and touching up painted surfaces. To make minor repairs, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Paint, Green, (Color 14187)	(Note 1)
As Required	Lacquer-Cellulose Nitrate, Gloss Color 622, Jet Black	MIL-L-7178
As Required	Adhesive	NIIN 00-738-6429

Notes: 1. Use any available green paint, chip color 14187, approved by local Environmental Protection Agency.

1. Consider tubing assemblies with minor dents, not causing flow restriction, serviceable. Smooth small scratches, abrasions, and nicks with a burnishing tool or aluminum wool.

2. To avoid burnishing the same area more than once, on each burnished area paint a band of the color and size a specified as follows:

a. Color bands shall cover an area not less than 2 inches nor more than 3 inches in length.

b. Green paint shall be used on aluminum tubing.

3. Condemn nicked, abraded, or scratched tubing in an area previously identified as burnished.

4. Consider container assemblies having minor dents or protrusions on center welds from overpressurization serviceable, provided the converter passes the vented Evaporation Loss Test. Normally, dents up to 3/8-inch deep will not affect the function of the converter.

Table 9-10. Inspection of Disassembled Parts

Part Nomenclature	Index Number	Inspect For	Remedy
Note: Index numbers in this table refer to figure 9-12.			
Identification and performance plates.	-53 and -51	Security, condition and legibility.	Secure in place or replace if damaged or illegible.
Warning and bench test decals.	-52 and -50	Presence and condition.	Apply or replace as required.
Handle.	-1	Bends and cracks.	Replace.
Tubing assemblies and manifold assembly.	-6, -33, and -45	Cracks, dents, nicks, scratches, twists or damaged connectors and tube nuts.	Replace.
Elbows and nipples.	All.	Cracks, dents, scratches and damaged threads.	Replace.
Male coupling assemblies.	-34 and -39	Visible damage.	Replace.
Shock mount assemblies.	-29, -30, and -31	Visible damage.	Replace.
Clamps.	-46	Condition.	Tighten or replace.
Mounting pad assembly.	-49	Cracks, broken welds, or other visible damage.	Replace.
Container assembly.	-10	Dents, chipped paint, or other visible damage.	Refer to paragraph 9-65 for size of acceptable dents. Restore finish by painting (paragraph 9-65).
Dust caps.	-22 and -23	Broken chain or damaged caps.	Replace.
Fuse clips.	-13	Damage.	Replace.
Note: Index numbers in this table refer to figure 9-13.			
Buildup seat.	-4	Scratches, nicks, or wear on sealing surfaces.	Replace.
Filler head.	-16	Cracks, wear, or any visible damage of sealing surfaces.	Replace.
Shaft.	-26	Bend, nicks, scratches, or wear.	Replace.
Combination valve housing.	-45	Scratches, nicks, or any visible damage to sealing surfaces.	Replace.

Table 9-10. Inspection of Disassembled Parts (Cont)

Part Nomenclature	Index Number	Inspect For	Remedy
Note: Index numbers in this table refer to figure 9-14.			
Pressure closing valve housing.	-16	Scratches, nicks, wear, or any visible damage on sealing surfaces.	Replace.
Stem.	-6	Scratches, nicks, wear, or any visible damage on sealing surfaces.	Replace.
Filter.	-4	Clogged pores or visible damage.	Clean and/or replace.

WARNING

When painting converter, ensure fittings, tubing, and valves are removed or masked prior to painting. Paint and other foreign matter associated with painting introduced into these components could create an explosion hazard when contacting oxygen.

5. On converter assemblies passing the vented Evaporation Loss Test and having dents and protrusions, paint a 3/4-inch diameter dot over each dent using black lacquer.

6. Secure pinch-off tube protective covers back in place over the pinch-off tube as follows:

NOTE

Prior to replacing pinch-off tube protective covet, an Evaporation Loss Test (vented condition) shall be performed in accordance with paragraph 9-53. This will ensure that the pinch-off tube was not damaged by whatever force loosened the protective cover.

7. Pinch-off tube protective covers maybe secured back, lace over the pinch-off tube as follows:

a. Clean area surrounding pinch-off tube and flange of protective cover by sanding followed by cleaning area using procedures outlined in NAVAIR 13-1-6.4-1.

b. Mix equal portions of part A RESIN and part B ACTIVATOR. Mix thoroughly following instructions provided with adhesive.

c. Apply adhesive to flange of protective cover. Place cover over pinch-off tube, pressing in place to achieve a good bond. Wipe off excess adhesive and allow cover to remain undisturbed for approximately 8 hours.

9-66. ASSEMBLY.

9-67. Assembly of the liquid oxygen converter assembly is essentially the reverse of disassembly. Tests and adjustments are required on certain subassemblies as they are assembled to the converter.

WARNING

Prior to use, inspect leak detection compound. Compound which is not clear and free from suspended material/sediment is considered contaminated and shall be disposed of. Compound exhibiting peculiar odors such as acetone or alcohol is considered contaminated and shall be disposed of.

CAUTION

Use anti-seize tape (MIL-T-27730) on all male pipe thread fittings. Apply single layer of tape, overlapping ends just enough to avoid gap in tape when fitting is installed. To prevent tube blockage, ensure that tape is clear of last thread.

Do not use anti-seize tape on flared or straight thread fittings.

NOTE

Using converter overhaul parts kit (P/N 1601217-1) install new O-rings, gaskets, seals, and replacements parts wherever possible, depending on extent of disassembly.

9-68. ASSEMBLY OF PRESSURE CLOSING VALVE. To assemble the pressure closing valve, proceed as follows:

NOTE

Assemble the pressure closing valve using index numbers assigned to figure 9-13.

1. Assemble bellows assembly (13) by installing O-ring (14), spring (12), and adjusting screw (11). Install adjusting screw to position noted before disassembly.

2. Using a spanner wrench, install assembled bellows into pressure closing valve housing (16).

NOTE

Tiedown strap (8), cover (9), and disc (10) are not installed at this time. These parts will be installed after entire converter assembly is assembled and adjusted for correct operation.

3. Install disc (7) onto stem (6). Insert stem (6), spring (5), and filter (4) (coarse side up) into housing (16).

4. Using retaining ring pliers, install ring (3), securing parts inserted in step 3. Ensure that retaining ring is properly seated in groove provided.

5. Install nipple (1) and elbow (2) into housing (16). Position where noted before disassembly.

9-69. DELIVERY PRESSURE VERIFICATION/ LEAKAGE TEST OF PRESSURE CLOSING VALVE. To verify delivery pressure and to leak test the pressure closing valve following assembly, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Index numbers in parentheses refer to figure 9-14.

1. Attach gage to buildup valve port nipple (1).

2. Attach buildup coil port elbow (2) TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

3. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

4. Open OXYGEN SUPPLY valve (V-6) and apply 120 psig as indicated on TEST PRESSURE gage (PG-1). Pressure gage attached to elbow (1) relief should read between 55 and 90 psig.

NOTE

If outlet pressure does not fall within the 55 to 90 psig limit, adjust the pressure closing valve in accordance with paragraph 9-73, step 17.

5. Ensure that 120 psig is indicated on TEST PRESSURE gage (PG-1). Hold pressure for 5 minutes. Any increase of pressure shown on gage attached to nipple (1) indicates internal leakage and cause for rejection.

6. Apply leak detection compound to nipple (1), elbow (2), and bellows assembly (13). No leakage is allowed. Correct any leakage prior to proceeding.

7. Close OXYGEN SUPPLY valve (V-6) and bleed test pressure using SYSTEM BLEED valve (V-5).

8. Remove pressure closing valve from test stand port and remove gage installed in step 1.

9. Remove any excess leak detection compound from valve assembly and set aside.

NOTE

Pressure closing valve will be installed and adjusted in paragraph 9-73, step 17.

9-70. ASSEMBLY OF COMBINATION VALVE. To assemble the combination valve, proceed as follows:

NOTE

Assemble the combination valve using figure 9-11 and index numbers assigned to figure 9-13.

1. If required, assemble retainer (35) by installing screw stop (36) and adjusting screw (37) to positions noted prior to disassembly.

2. Insert filter screen (43) into spring cup (44) and carefully place cup into relief valve port with filter screen facing up.

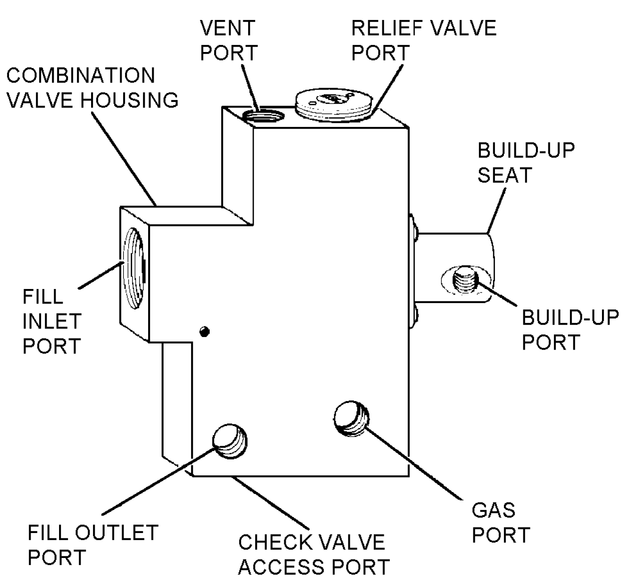


Figure 9-11. Location of Ports on Combination Valve Assembly

3. Place spring (42) on valve (41) and insert unit into valve port with spring (42) resting in spring cup.

4. Place gasket (40) onto bellows (39) and insert into relief valve port.

5. Insert spring (38) into bellows (39) and install assembled retainer (35). Tighten retainer in place using a spanner wrench.

6. Place O-ring (34) onto insert unit check valve seat (33) and insert unit check valve access port of housing (45); O-ring side first.

7. Insert sleeve (32), check valve head (31) (dimple side first), spring (30), and washer (29) (collar side first) into check valve access port.

8. Using retaining ring pliers, secure inserted parts in place with ring (28). Ensure that retaining ring is properly seated in groove provided.

9. Install expansion plug (27) into check valve access port.

10. Using retaining ring pliers, install ring (10) in groove provided on ball (11) and insert unit into buildup port of housing (45).

11. Place spring (9) on ball (11).

12. Place washer (7) and preformed packing (8) onto buildup seat (4) and insert into buildup port of housing (45).

13. Secure buildup seat (4) to housing using spacer (6) and four screws (5). Position buildup seat where noted prior to disassembly.

14. Using retaining ring pliers, install ring (25) into appropriate groove on shaft (26).

15. Place plunger sleeve (24), washer (23), spring (22), and washer (21) onto shaft (26). Using retaining ring pliers, secure items with ring (20). Ensure that ring is seated in groove provided.

16. Install preformed packing (19) into groove provided on shaft (26).

17. Insert assembled shaft into fill inlet port of housing (45).

18. Install filler head insert (17) into filler head (16), if required.

19. Place gasket (18) on filler head (16) and install filler head into fill inlet port. Tighten filler head with strapwrench and secure with bristo setscrew (15).

20. Attach cap assembly (12) with screw (13) and washer (14).

21. Install elbow (1), nipple (2), and elbow (3) to position noted before disassembly.

9-71. LEAKAGE TEST PORT ASSEMBLY OF COMBINATION VALVE. To perform the various leakage tests on the assembled combination valve, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
2	Capnut	AN929-5
1	Hose Assembly, Stand, Test	59A120-B5-12
1	Plug, Pipe	MS20913-C-3
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Using capnut, cap the gas port elbow.

2. Attach adapter to filler head of combination valve and turn knurled knob clockwise.

3. Attach vent port of combination valve to BELL JAR BOTTOM COUPLING (C-1). Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

4. Open OXYGEN SUPPLY valve (V-6) and apply 35 psig as indicated on TEST PRESSURE gage (PG-1).

5. Apply leak detection compound to fill port, no leakage allowed.

6. Close OXYGEN SUPPLY valve (V-6) and bleed test stand using SYSTEM BLEED valve (V-5).

7. Remove adapter from filler head of combination valve and disconnect test stand BELL JAR BOTTOM COUPLING (C-1) from vent port of combination valve.

8. Connect test stand BELL JAR BOTTOM COUPLING (C-1) to buildup port elbow (3).

9. Using pipe plug, plug vent port of combination valve.

10. Open OXYGEN SUPPLY valve (V-6) and apply 100 psig as indicated TEST PRESSURE gage (PG-1).

11. Apply leak detection compound to combination valve. No leakage is allowed.

12. Close OXYGEN SUPPLY valve (V-6) and bleed pressure from test stand using SYSTEM BLEED valve (V-5).

13. Place combination valve in the vented position by attaching adapter to filler head of combination valve and uncap gas port (1).

14. Place test stand bell jar over combination valve and secure in place.

15. Place FLOWMETER SELECTOR valve (V-1) in the 0.0-0.25 lpm position.

16. Using OXYGEN SUPPLY valve (V-6), apply 35 psig to the combination valve as indicated on TEST PRESSURE gage (PG-2).

17. Using test stand hose assembly, slowly interconnect BELL JAR TOP COUPLING (C-2) to FLOWMETER connection (NIP-1) while observing FLOWMETER INDICATOR gage (PG-2).

18. Maintain 35 psig to the combination valve for 2 minutes. Leakage on FLOWMETER INDICATOR gage (PG-2) shall not exceed 0.25 lpm.

19. Close OXYGEN SUPPLY valve (V-6) and bleed pressure from test stand using SYSTEM BLEED valve (V-5).

20. Disconnect combination valve from test stand, unplug vent port and remove adapter.

21. Test and adjust relief valve as follows:

a. Cap gas port nipple (2) with capnut.

b. Connect buildup port elbow (3) to test stand BELL JAR BOTTOM COUPLING (C-1). Install and secure bell jar.

c. Using hose assembly, interconnect BELL JAR TOP COUPLING (C-2) to FLOWMETER connection (NIP-4).

d. Turn FLOWMETER SELECTOR valve (V-1) to 0-150 lpm position.

CAUTION

Do not apply pressure above 130 psig. When applying pressure with OXYGEN SUPPLY valve (V-6) observe TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2). Rapid surges of pressure could damage test stand gages.

e. Open OXYGEN SUPPLY valve (V-6) slowly and apply pressure to the relief valve. Pressure will be indicated on TEST PRESSURE gage (PG-1).

f. When pressure reaches 100 to 120 psig, relief valve shall be venting a minimum 100 lpm as indicated on FLOWMETER INDICATOR gage (PG-2).

g. Disconnect test stand hose assembly from FLOWMETER connection (NIP-4).

h. Turn FLOWMETER SELECTOR valve (V-1) to 0.0-0.25 lpm position.

i. Using test stand assembly, slowly interconnect BELL JAR TOP COUPLING (C-2) to FLOWMETER connection (NIP-1) while observing FLOWMETER INDICATOR gage (PG-2).

j. With 95 psig applied to the relief valve as indicated on TEST PRESSURE gage (PG-1) maximum allowable leakage, indicated on FLOWMETER INDICATOR gage (PG-2) shall be 0.01 lpm.

NOTE

If readings in steps f and j are acceptable, proceed to step n.

If readings are not acceptable, adjust relief valve in accordance with steps k through m.

k. Remove bell jar from combination valve.

l. If valve relieves below 100 psig, turn adjusting screw (37) clockwise. If valve relieves above 120 psig, turn adjusting screw (37) counterclockwise. Turn stopscrew (36) to obtain the required flow.

NOTE

Turning stopscrew clockwise will increase flow, counterclockwise will decrease flow.

m. Place bell jar over combination valve and secure in place. Repeat steps c through j.

NOTE

It may be necessary to repeat steps k through m several times to obtain proper pressure and flow settings.

n. At completion of test and adjustment close OXYGEN SUPPLY valve (V-6) and open SYSTEM BLEED valve (V-5), remove bell jar, disconnect combination valve, uncap all ports, and set valve aside, ready for installation.

9-72. ASSEMBLY OF CONTAINER. To assemble the container assembly, proceed as follows:

NOTE

Assemble the container assembly using index numbers assigned to figure 9-12.

1. Secure connection bracket (26) and fuse clips (13) with screws (14), washers (15), and nuts (16).

2. Assemble and attach electrical connectors (18, 19) to bracket (26) with respective nuts and washers.

3. Attach cap and chain assemblies (22, 23) with screw (24) and nuts (25).

9-73. COMPLETION OF ASSEMBLY. To complete the assembly of the converter, proceed as follows:

CAUTION

When installing tube assemblies, ensure that fittings to which tube nuts are to be attached are properly aligned with tube to prevent crossthreading. Hold connecting fittings with open end wrench to avoid straining or breakage when tightening. Hold tubing away from other components of converter assembly while tightening so that a minimum 1/16-inch clearance is maintained. It may be necessary to slightly bend some tube assemblies to maintain this clearance. Ensure that tubing is not crimped after bending process.

NOTE

To complete the assembly of the converter, use index numbers assigned to figure 9-12 unless otherwise noted.

1. Install coupling assembly (39) in manifold block (41).

2. Install nipple assembly (40) into manifold block (41) and attach assembled manifold block to mounting pad (49) using two screws (42).

3. Secure manifold assembly (45) to mounting pad (49) using screws (47), clamps (46), and nuts (48).

NOTE

A shock mount assembly consists of two washers (31), shock mount (32), two cup-shock pads (29), and shock mount (30).

4. Secure container assembly (10) to mounting pad assembly (49) using screw (11), shock mount assemblies, and nuts (12).

5. Tighten screw (11) and nut (12) at each shock mount so that the distance from the top of the mounting pad to the bottom of each foot of the container assembly is 5/8 ±1/32 inch.

6. Attach elbow (9) and tee fitting (8) to container assembly (10).

7. Install cap assembly (7) on tee fitting (8).

8. Mount pressure closing valve (43) to mounting pad assembly (49) with two screws (44).

9. Carefully mount combination valve (35) to valve mounting plate (38) with four screws (37).

10. Attach combination valve and valve mounting plate to mounting pad assembly (49) with four screws (36).

11. Connect tube nuts of manifold assembly (45) to combination valve (35), pressure closing valve (43), tee fitting (8), and manifold block (41).

12. Attach coupling assembly (39) to combination valve (35).

13. Attach pressure closing valve-to-buildup port tube (33) to elbow (1, figure 9-14) atop pressure closing valve (43) and buildup port elbow (3, figure 9-13) of combination valve (35).

14. Attach vent tube assembly (6) at container and at gas port nipple, (2, figure 9-13) of combination valve.

15. Attach handle (1) with two screws (2), two washers (3), two bushings (5), and two nuts (4).

16. After completion of assembly, Bench Test the converter in accordance with paragraph 9-41.

17. During post assembly Bench Test, it may be necessary to adjust pressure closing valve (43) while performing the Flow Test, paragraph 9-51. If so, proceed as follows:

NOTE

Index numbers in parentheses refer to figure 9-14.

The 70- to 75-psig operating pressure is for adjustment purposes only. If converter maintains 55 to 90 psig, no adjustment is required. If converter pressure is above or below this range, adjust pressure closing valve to maintain 70 to 75 psig.

a. If required, remove disc (10) by cutting strap (8) and removing cover (9).

b. Using a screwdriver, turn adjusting screw (11) until a supply pressure of 70 to 75 psig is maintained with a flow of 120 lpm.

NOTE

Turn adjusting screw (11) clockwise to increase valve closing pressure and counterclockwise to decrease valve closing pressure. Flow converter at least 30 minutes to ensure that pressure is constant.

c. After correct setting of pressure closing valve is ensured, install cupped disc (10) (convex side up) and cover (9). Secure cover (9) in place using strap (8).

Section 9-5. Illustrated Parts Breakdown

9-74. GENERAL.

9-75. This section lists and illustrates the assemblies and detail parts of the Liquid Oxygen Converter Assembly, Type GCU-29/A, P/N 3263006-0101, manufactured by Litton Life Support, formerly Bendix Corporation (CAGE 99257).

9-76. The Illustrated Parts Breakdown should be used during maintenance when requisitioning and identifying parts.

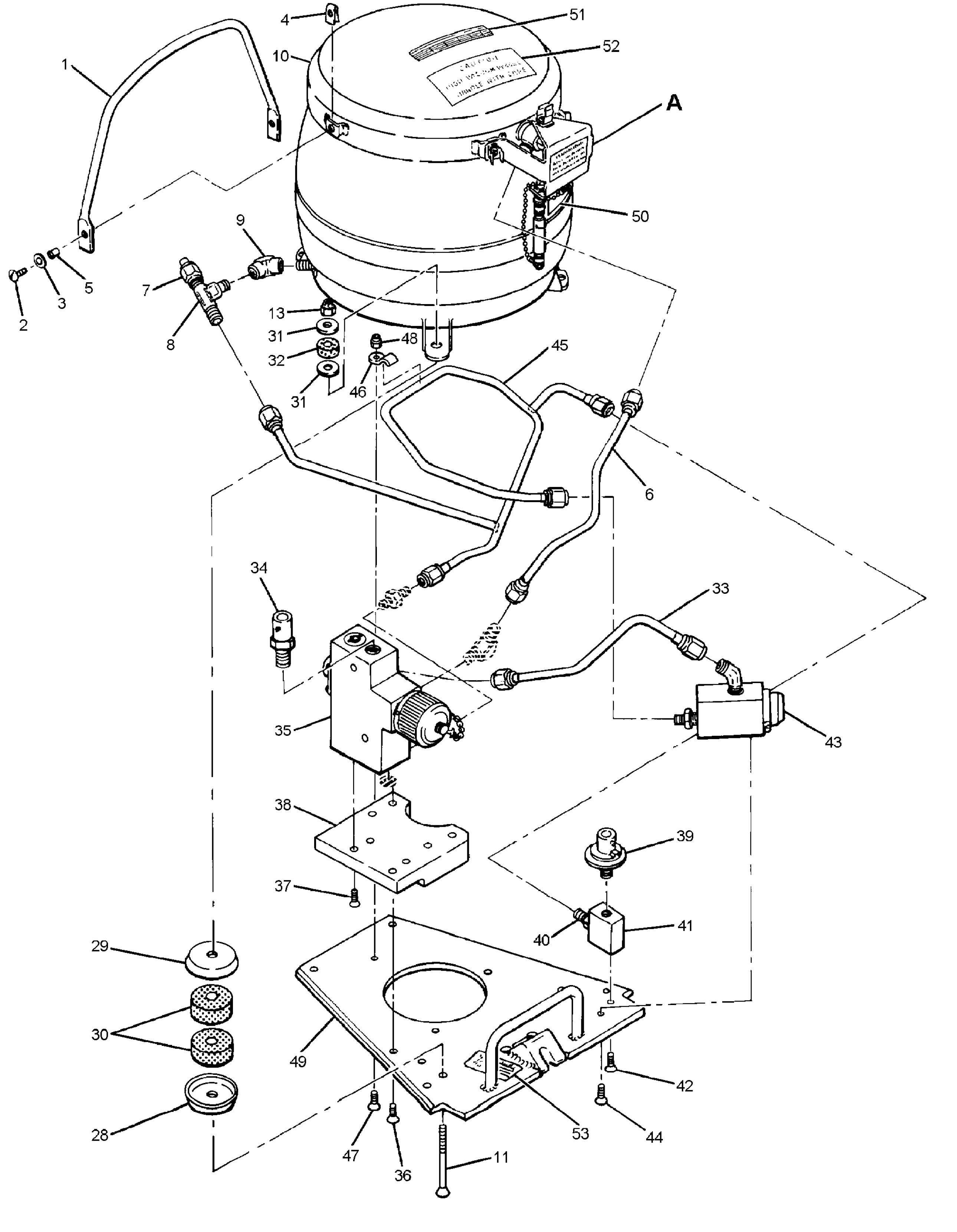


Figure 9-12. Liquid Oxygen Converter, Type GCU-29/A, P/N 3263006-0101 (Sheet 1 of 2)

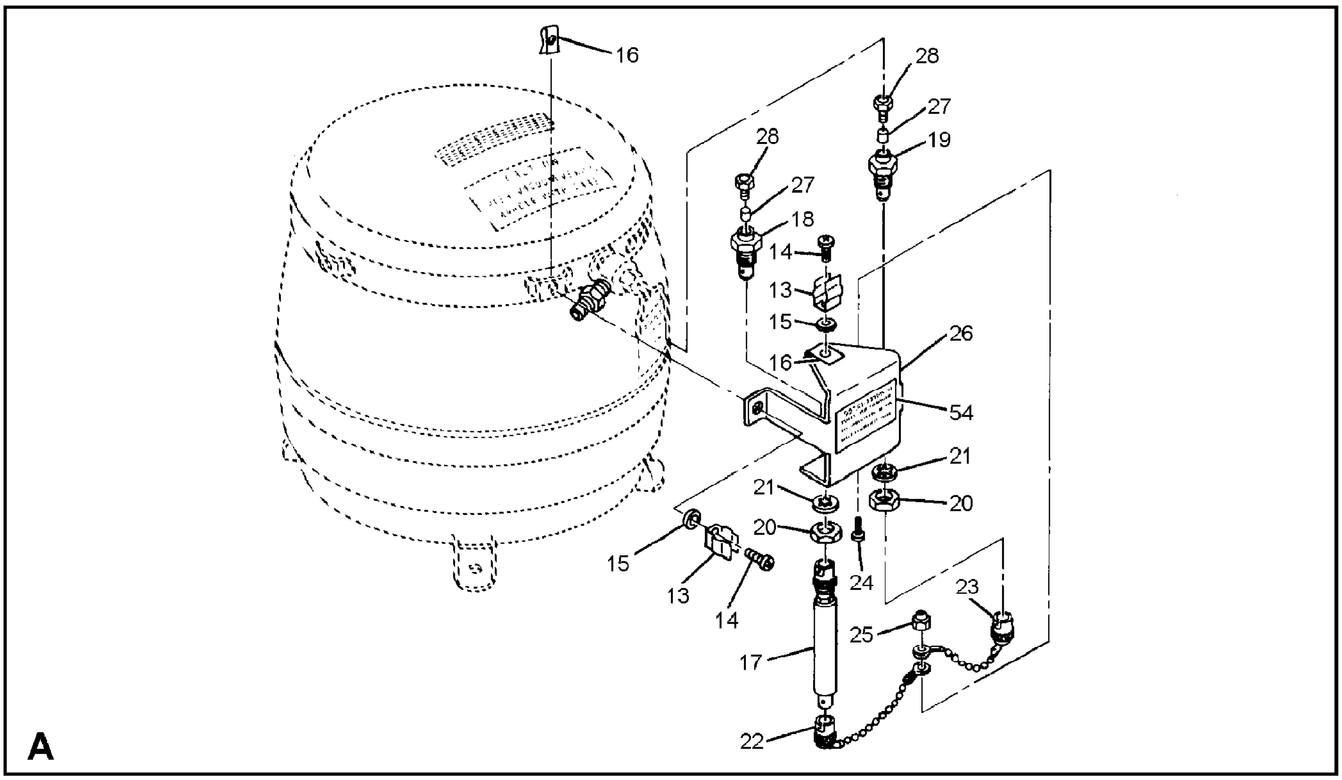


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Figure 9-12. Liquid Oxygen Converter, Type GCU-29/A, P/N 3263006-0101 (Sheet 2 of 2)

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
9-12	3263006-0101	CONVERTER ASSEMBLY, Liquid oxygen, 10-liter (Parts kit available)	REF	
-1	1611453-1	. HANDLE	1	
		(ATTACHING PARTS)		
-2	AN525-832-6	. SCREW	2	
-3	WO-8SS	. WASHER	2	
-4	C14938SS832	. NUT, “U” Type (CAGE 78553)	2	
		---*---		
-5	1611434-1	. BUSHING	2	
-6	1628322-1	. TUBE ASSEMBLY, Vent	1	
-7	AN929-5	. CAP ASSEMBLY	1	
-8	MS20825-5D	. TEE	1	
-9	AN916-1D	. ELBOW	1	
-10	1628538-1	. CONTAINER ASSEMBLY, Liquid oxygen	1	
		(ATTACHING PARTS)		
-11	MS24694-C112	. SCREW, Machine	4	
-12	MS21045C4	. NUT, Self-locking	4	
		---*---		
-13	104002	. . CLIP, Fuse (CAGE 75915)	3	
		(ATTACHING PARTS)		
-14	MS51957-43	. . SCREW, Machine	3	
-15	WO-8SS	. . WASHER	3	
-16	C14938SS832	. . NUT, “U” Type (CAGE 78553)	3	
		---*---		
-17	3270010-0101	. . VOLTAGE DIVIDER	1	
-18	6690-1	. . CONNECTOR, Electrical miniature coaxial, “B” polarity	1	
-19	6691-1	. . CONNECTOR, Electrical miniature coaxial, “E” polarity	1	
-20	No Number	. . . NUT (Note 1)	1	
-21	No Number	. . . LOCKWASHER (Note 1)	1	
-22	1-606-1	. . CAP AND CHAIN	1	
-23	1-606-2	. . CAP AND CHAIN	1	
		(ATTACHING PARTS FOR INDEX NUMBERS 22 and 23)		
-24	RO-405SS	. . SCREW, Round head	1	
-25	NTNO-4SCP	. . STOPNUT	1	
		---*---		
-26	1627127-1	. . BRACKET, Connector	1	
-27	1611421-1	. . SPACER, Connector	1	
-28	1611420-1	. . ADAPTER, Armored wire	1	
-29	1611428-2	. CUP, Shock pad	8	
-30	1622347-3	. SHOCK MOUNT	4	
-31	1603660-38	. WASHER	8	
-32	1622347-1	. SHOCK MOUNT	4	
-33	1628327-1	. TUBE ASSEMBLY, Pressure closing to buildup	1	
-34	MS22068-6	. COUPLING ASSEMBLY	1	

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
9-12-35	1620660-3	. VALVE ASSEMBLY, Combination . . . . (figure 9-13 for BKDN) (ATTACHING PARTS)	1	
-36	MS24693-C95	. SCREW, Machine	4	
-37	MS24693-C30	. SCREW, Machine . . . . ---*---	4	
-38	1628516-1	. PLATE, Valve mounting	1	
-39	MS22068-4	. COUPLING ASSEMBLY	1	
-40	1627160-1	. NIPPLE ASSEMBLY	1	
-41	1627126-1	. MANIFOLD BLOCK . . . . (ATTACHING PARTS)	1	
-42	MS24693-C95	. SCREW, Machine . . . . ---*---	2	
-43	1616733-3	. VALVE ASSEMBLY, Pressure closing . . . . (figure 9-14 for BKDN) (ATTACHING PARTS)	1	
-44	MS24693-C27	. SCREW, Machine . . . . ---*----	2	
-45	1628325-1	. MANIFOLD ASSEMBLY . . . . (ATTACHING PARTS)	1	
-46	1611433-1	. CLAMP, Tube	4	
-47	MS24693-C6	. SCREW, Machine	4	
-48	MS20365-440	. NUT . . . . ---*---	4	
-49	1628518-1	. PAD ASSEMBLY, Mounting	1	
-50	CL227C2-1	. DECAL, Bench test date	1	
-51	1616834-1	. PLATE, Test data	1	
-52	1600482-1	. PLATE, Warning	1	
-53	1616833-1	. PLATE, Identification	1	
	1601217-1	. PARTS KIT, Converter overhaul	1	
-54	1628637-1	. DECAL	1	
	Notes: 1. Nut and lockwasher come as part of the electrical connector and are used as attaching parts.			

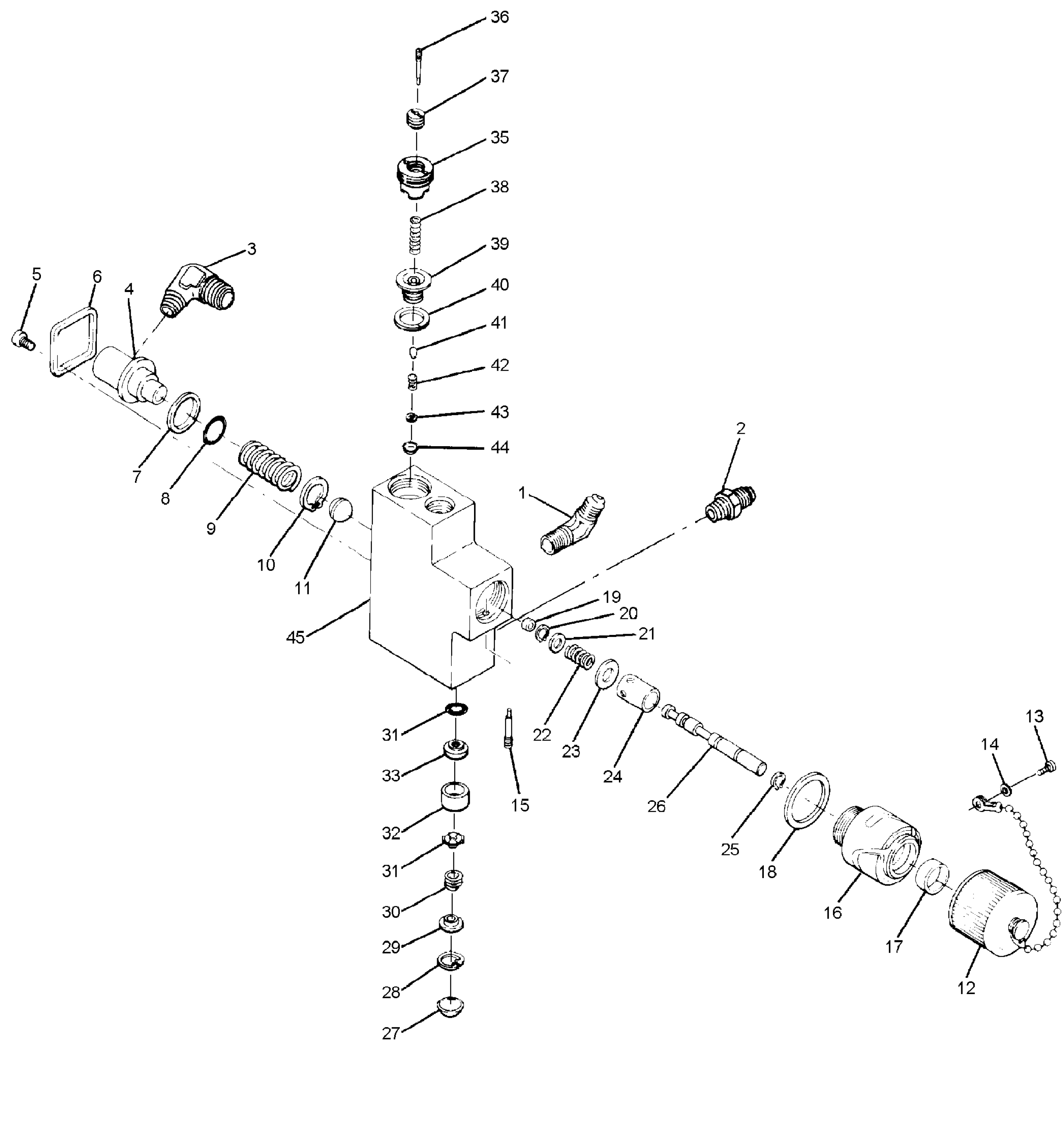

Figure 9-13. Combination Valve Assembly

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
9-13	1620660-3	VALVE ASSEMBLY, Combination . . . . (See figure 9-12 for NHA)	REF	
-1	MS20822-5D	. ELBOW, 90°	1	
-2	AN816-5D	. NIPPLE	1	
-3	MS20822-5D	. ELBOW, 90°	1	
-4	1620659-1	. SEAT, Buildup	1	
		(ATTACHING PARTS)		
-5	MS51957-27	. SCREW, Machine	4	
-6	1620654-1	. SPACER, Clamping	1	
		---*---		
-7	1603661-69	. WASHER, Nonmetallic	1	
-8	1602321-35	. PACKING, Preformed	1	
-9	815404	. SPRING, Helical compression	1	
-10	MS16626-4050	. RING, Retaining	1	
-11	1620663-1	. BALL, Valve	1	
-12	MS27566-1	. CAP ASSEMBLY	1	
		(ATTACHING PARTS)		
-13	MS51957-27	. SCREW, Machine	1	
-14	AN960C6L	. WASHER	1	
		---*---		
-15	MBFS404SCP	. SETSCREW, Bristo	1	
-16	1620304-1	. HEAD, Filler	1	
-17	1602412-1	. INSERT, Filler head	1	
-18	1620305-1	. GASKET	1	
-19	816919-14	. PACKING, Preformed	1	
-20	MS16624-4025	. RING, Retaining	1	
-21	1603660-123	. WASHER	1	
-22	1611448-1	. SPRING, Helical compression	1	
-23	1603660-113	. WASHER	1	
-24	1611449-1	. SLEEVE, Plunger	1	
-25	MS 16624-4025	. RING, Retaining	1	
-26	1620656-1	. SHAFT	1	
-27	778488-5	. PLUG, Expansion	1	
-28	MS16625-4056	. RING, Retaining	1	
-29	1600818	. WASHER, Spring guide	1	
-30	815395	. SPRING, Helical compression	1	
-31	1600820	. HEAD, Valve, check	1	
-32	1616784-1	. SLEEVE, Hold down	1	
-33	1600821	. SEAT, Valve, check	1	
-34	813752	. O-RING	1	
-35	1620550-1	. RETAINER	1	
-36	1620657-1	. SCREW, Stop	1	
-37	1620658-1	. SCREW, Adjusting	1	
-38	1613622-1	. SPRING, Helical compression	1	
-39	1613617-1	. BELLOWS ASSEMBLY	1	
-40	1613610-1	. GASKET	1	
-41	1613614-1	. VALVE	1	

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
9-13-42	1613616-1	. SPRING, Helical compression	1	
-43	1620570-1	. SCREEN, Filler	1	
-44	1620655-1	. CUP, Spring	1	
-45	1620606-1	. HOUSING, Combination valve	1	

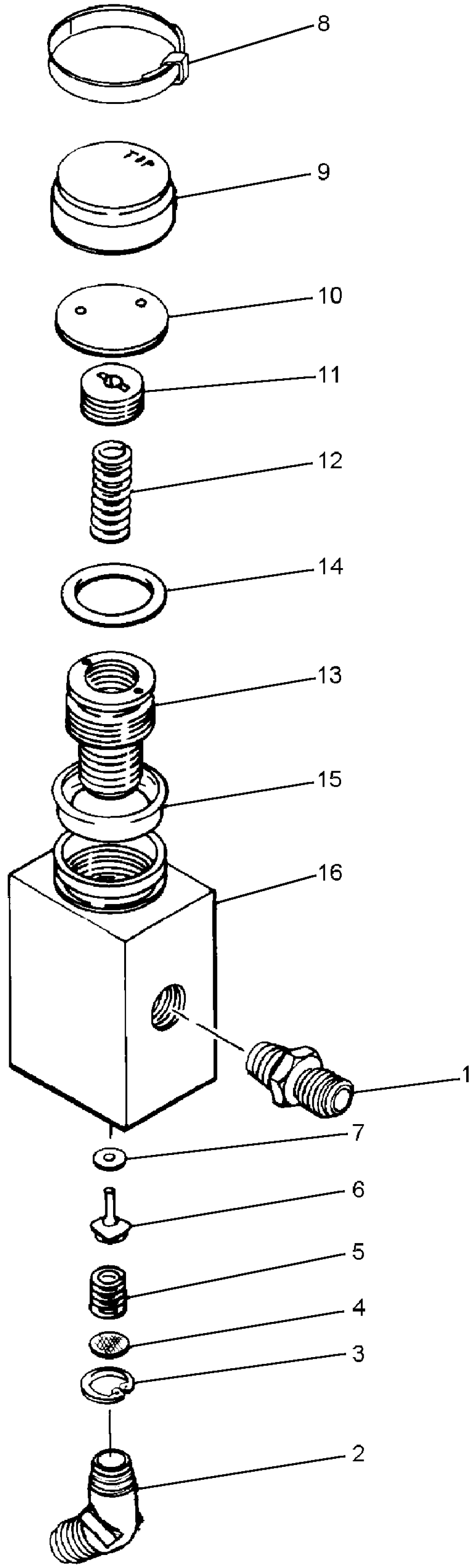

Figure 9-14. Pressure Closing Valve Assembly

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
9-14	1616733-3	VALVE ASSEMBLY, Pressure closing . . . . (figure 9-12 for NHA)	REF	
-1	AN816-5-4D	. NIPPLE	1	
-2	MS20823-5D	. ELBOW, 45°	1	
-3	MS16625-4037	. RING, Retaining	1	
-4	815634-7	. FILTER	1	
-5	1616732-1	. SPRING, Helical compression	1	
-6	1616730-1	. STEM	1	
-7	1616728-1	. DISC	1	
-8	MS3367-5-8	. STRAP, Tiedown	AR	
-9	1611857-1	. COVER	1	
-10	1611319-1	. DISC, Cupped	1	
-11	1616788-1	. SCREW, Spring adjusting	1	
-12	815735	. SPRING, Helical compression	1	
-13	1616790-1	. BELLOWS ASSEMBLY	1	
-14	815743	. PACKING, O-ring	1	
-15	1627280-1	. RING, Vibration damper	1	
-16	1616697-1	. HOUSING	1	

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Part Number	Figure and Index Number	SM&R Code
AN525-832-6	9-12-2	
AN816-5-4D	9-14-1	PAOZZ
AN816-5D	9-13-2	PAOZZ
AN916-1D	9-12-9	PAOZZ
AN929-5	9-12-7	PAOZZ
AN960C6L	9-13-14	PAOZZ
CL227C2-1	9-12-50	
C14938SS832	9-12-4	PAGZZ
	9-12-16	
MBFS404SCP	9-13-15	
MS16624-4025	9-13-20	PAOZZ
	9-13-25	
MS16625-4037	9-14-3	PAOZZ
MS16625-4056	9-13-28	PAOZZ
MS16626-4050	9-13-10	PAOZZ
MS20365-440	9-12-48	PAGZZ
MS20822-5D	9-13-1	PAOZZ
	9-13-3	
MS20823-5D	9-12-2	PAOZZ
MS20825-5D	9-12-8	PAOZZ
MS21045C4	9-12-12	PAOZZ
MS22068-4	9-12-39	PAOZZ
MS22068-6	9-12-34	PAOZZ
MS24693-C27	9-12-44	PAOZZ
MS24693-C30	9-12-37	PAOZZ
MS24693-C6	9-12-47	PAOZZ
MS24693-C95	9-12-36	PAOZZ
	9-12-42	
MS24694-C112	9-12-11	PAGZZ
MS27566-1	9-13-12	PAOZZ
MS3367-5-8	9-14-8	PAOZZ
MS51957-27	9-13-5	PAOZZ
	9-13-13	
MS51957-43	9-12-14	PAOZZ
NTNO-4SCP	9-12-25	PAOZZ
RO-405SS	9-12-24	PAOZZ
WO-8SS	9-12-3	
	9-12-15	
1-606-1	9-12-22	PAOZZ
1-606-2	9-12-23	
104002	9-12-13	PAOZZ
1600482-1	9-12-52	
1600818	9-13-29	PAGZZ
1600820	9-13-31	PAGZZ
1600821	9-13-33	PAGZZ
1601217-1	9-12	
1602321-35	9-13-8	PAOZZ

Part Number	Figure and Index Number	SM&R Code
1602412-1	9-13-17	PAOZZ
1603660-113	9-13-23	PAOZZ
1603660-38	9-12-31	PAGZZ
1603661-69	9-13-7	PAGZZ
1611319-1	9-14-10	PAGZZ
1611420-1	9-12-28	
1611421-1	9-12-27	
1611428-1	9-12-29	
1611433-1	9-12-46	PAOZZ
1611434-1	9-12-5	PAGZZ
1611448-1	9-13-22	PAGZZ
1611449-1	9-13-24	PAGZZ
1611453-1	9-12-1	PAOZZ
1611857-1	9-14-9	PAGZZ
1613610-1	9-13-40	PAGZZ
1613614-1	9-13-41	
1613616-1	9-13-42	PAGZZ
1613617-1	9-13-39	PAGZZ
1613622-1	9-13-38	PAGZZ
1616697-1	9-14-16	
1616728-1	9-14-7	PAGZZ
1616730-1	9-14-6	PAGZZ
1616732-1	9-14-5	PAGZZ
1616733-3	9-12-43	PAGGG
	9-14	
1616784-1	9-13-32	PAOZZ
1616788-1	9-14-11	PAGZZ
1616790-1	9-14-13	PAGZZ
1616833-1	9-12-53	
1616834-1	9-12-51	
1620304-1	9-13-16	
1620305-1	9-13-18	
1620550-1	9-13-35	PAGZZ
1620570-1	9-13-43	PAGZZ
1620606-1	9-13-45	
1620654-1	9-13-6	
1620655-1	9-13-44	PAGZZ
1620656-1	9-13-26	PAOZZ
1620657-1	9-13-36	PAGZZ
1620658-1	9-13-37	PAOZZ
1620659-1	9-13-4	PAOZZ
1620660-3	9-12-35	PAGGG
	9-13	
1620663-1	9-13-11	PAGZZ
1622347-1	9-12-32	PAGZZ
1622347-3	9-12-30	
1627126-1	9-12-41	PAGZZ

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Part Number	Figure and Index Number	SM&R Code
1627127-1	9-12-26	
1627160-1	9-12-40	PAGZZ
1627280-1	9-14-15	
1628322-1	9-12-6	PAOZZ
1628325-1	9-12-45	PAGZZ
1628327-1	9-12-33	
1628516-1	9-12-38	
1628518-1	9-12-48	
1628538-1	9-12-10	PAGBZ
1628637-1	9-12-54	

Part Number	Figure and Index Number	SM&R Code
3263006-0101	9-12	PAOGD
3270010-0101	9-12-17	PAOZZ
6690-1	9-12-19	PAOZZ
778488-5	9-13-27	PAGZZ
813752	9-13-34	KCGZZ
815395	9-13-30	PAGZZ
815634-7	9-14-4	PAGZZ
815743	9-14-14	PAGZZ
816919-14	9-13-19	PAGZZ

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GLOSSARY

ACC. Abbreviation for Air Crew Systems Change.

AIRCREWMEMBER. An aircraft crewmember. Passengers are not considered aircrewmembers.

ANTI-SEIZE TAPE. A tape of any of several thin plastic-film materials (such as tetrafluorethylene) characterized by a waxy, oily texture, and used to prevent binding between mating surfaces of threaded parts when applied to the male threaded portion.

APPROX. Abbreviation for approximately.

ASSEMBLY. A grouping of parts fitted together to form a complete unit.

ATMOSPHERIC PRESSURE. Pressure at sea level, expressed as 14.696 pounds per square inch, absolute, or 29.92 inches mercury column (barometer). See also: PSIA and INHg.

C. Abbreviation for Celsius.

CAUTION. Indicates danger to equipment. The caution precedes the step or item to which it refers.

CDI. Abbreviation for collateral duty inspector.

CCM. Abbreviation for cubic centimeters per minute.

CO_2. Abbreviation for carbon dioxide.

COMBUSTIBLE MATERIAL/SUBSTANCE. Any material or substance capable of burning in the presence of oxygen. See also: EXPLOSIVE MIXTURE, FLAMMABLE MATERIAL.

COML. Abbreviation for commercial. Refers to parts that are commercially available.

COMPONENT. Item of equipment making up part of an assembly or subassembly.

CONFIGURATION. The makeup, size, shape, and relative location of parts of an item of equipment and its accessories. This includes the composition of the materials as well as marking details. The configuration of each equipment is specified by Government drawings, military specifications and modification instructions.

CONVOLUTION. Used in this manual as the protruding side or portion of a diaphragm.

DETAIL PART. See COMPONENT.

DIA. Abbreviation for diameter.

DISPOSITION. Instructions on what is to be done with or to an item.

ELASTOMER. Any of various elastic substances resembling rubber.

ENSURE. To inspect closely, and to test the condition of an item.

EXAMINE. To inspect closely, and to test the condition of an item.

EXPLOSIVE MIXTURE. Any mixture of a combustible material or substance and oxygen capable of violent burning (detonation) either spontaneously or with the external application of heat. See also: COMBUSTIBLE MATERIAL/SUBSTANCE FLAMMABLE Material.

F. Abbreviation for Fahrenheit.

FLAMMABLE MATERIAL. Any material capable of being easily ignited and of burning with extreme rapidity.

FLAP PATTERN. See TEMPLATE.

FLUID. Gas, vapor, or liquid.

FREEZING POINT. Temperature at which a given liquid substance will solidify or freeze upon removal of heat. Freezing point of water is 32°F (0°C).

FULL. (In reference to oxygen cylinders) A full oxygen cylinder is a cylinder which is pressurized to its rated pressure. With respect to a high pressure oxygen cylinder. 1800 psig is considered full.

FUNCTIONAL TEST. A test which puts an item to use to determine if it operates properly.

GAPL. Abbreviation for Group Assembly Parts List. The GAPL, a section of the Illustrated Parts Breakdown, shows how major assemblies are disassembled into assemblies and detail parts.

HEAT EXCHANGER. Apparatus in which heat is exchanged from one fluid to another.

H_2O. Abbreviation for water.

Hg. Abbreviation for mercury.

IN. Abbreviation for inches.

IND. Abbreviation for indicated.

INH$_2$O. Abbreviation for inches of water column (27.68 inH$_2$O equals 1.0 PSI equals 2.036 inHg). See Also: inHg.

INHg. Abbreviation for inches of mercury column (0.07349 inHg equals 1.0 inH$_2$O). See also: inH$_2$O.

INSPECTION. A close examination for damage, wear and dirt. Also, a regularly scheduled examination of oxygen equipment and accessories.

LBS. Abbreviation for pounds.

LOX. Abbreviation for liquid oxygen.

LPM. Abbreviation for liters per minute.

MANUFACTURER'S CODES. Identification codes for every manufacturer listed as a procurement source in accordance with cataloging handbooks H4/H8, Commercial and Government Entity Codes.

MM. Abbreviation for millimeters.

MOLECULAR SIEVE. A cannister containing a nitrogen-absorbing chemical compound (zeolite) through which air is forced, providing enriched breathing oxygen.

NOC. Abbreviation for Navy Oxygen Cleaner.

NOTE. An informative item. The note may precede or follow the step or item to which it refers.

NUMERICAL INDEX. A part of the Illustrated Parts Breakdown. The numerical index includes all the part numbers listed in the GAPL, arranged in alphabetical-numerical sequence.

OBOGS. Abbreviation for Onboard Oxygen Generating System.

OEAS. Abbreviation for Oxygen Enriched Air System.

PRESSURE. The force exerted by a liquid or gas per unit of area on the walls of a container. See also: PSM, PSIA, and ATMOSPHERIC PRESSURE.

PRESSURE DROP. Loss in pressure, as from one end of a distribution line to the other, due to friction and other factors.

PRESSURE EXPLOSION. Explosion caused by rapid conversion of liquid oxygen to gaseous oxygen in a confined space due to evaporation and warming.

PROPER. Correct or authorized configuration or method.

PSI. Abbreviation for pounds per square inch. See also: PSI and PSIG.

PSIA. Abbreviation for pounds per square inch, absolute. Absolute pressure is measured from absolute zero (100% vacuum), rather than from normal, or atmospheric pressure. It equals gage pressure plus 14.696 pounds per square inch. See also: PSI, PSIG, and ATMOSPHERIC PRESSURE.

PSIG. Abbreviation for pounds per square inch, gage. Indicates pressure above ambient pressure, as indicated on a pressure gage vented to the atmosphere. See also: PSI and PSIA.

QA. Abbreviation for quality assurance.

QUALIFIED PERSONNEL. Qualified personnel are defined as personnel who have satisfactorily completed a prescribed course at a Navy Training School Fleet Readiness Aviation Maintenance Personnel Training Program (AMP), Inter Service/Factory Training, formal or informal In-Service Training (refer to OPNAVINST 4790.2 Series). In addition, a practical demonstration of the skills acquired in any of the foregoing training situations, to the satisfaction of the Work Center Supervisor/Division Officer is required before the designation "Qualified" can be assigned.

R. Abbreviation for radius.

REFILL. (In reference to oxygen cylinders) To refill is to recharge a cylinder, regardless of the residual pressure remaining within the cylinder.

REPAIRS, MAJOR. Repairs requiring special equipment, personnel, or materials normally not available at intermediate or local levels of maintenance.

REPAIRS, MINOR. Repairs that can be effected at intermediate or local levels of maintenance.

REF. Abbreviation for reference.

SM&R CODES. Abbreviation for source, maintenance, and recoverability codes. Comprised of three parts, a two-position source code, a two-position maintenance code, and a one-position recoverability code. Refer to NAVSUPINST 4423.29 for further details.

SPECIFIC GRAVITY. Density of fluid compared to density of water.

TEMPLATE. A pattern or gage usually in the form of a thin plate of cardboard, wood, or metal. It is used as a guide in the layout or cutting of flat work.

TORQUE. A force, or combination of forces, that tend to produce a rotating or twisting motion. Torque is often expressed pounds-inch (lbs-in.) or pounds-foot (lbs-ft.). A torque wrench is used to apply a measured torque.

TYP. Abbreviation for typical.

WARNING. Indicates danger to personnel. The warning precedes the step or item to which it refers.

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